An empirical investigation to evaluate the impact of travel habits at community level for the formulation of sustainable transport strategies: a case study approach

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Abstract

Transport is a central component to most political, economic, social and environmental issues throughout most inhabited societies. The concerns of transport have become widely acknowledged and accepted. Today, it is broadly accepted that promoting alternative forms of transport such as walking, cycling and public transport use is one solution to tackle environmental concerns. Although how to deliver, implement and develop transport strategies that will encourage a reduction in car use are still highly debated. To date, most research studies have not investigated individuals who are recognised to have a strong affiliation to the car. This work intends to benefit transport stakeholders (e.g. policy makers, planners, campaigners and car users) by reducing car usage in favour forms of alternative transport.

Transport stakeholders such as planners and policymakers have long strived to reduce car usage. Many studies have attempted to develop strategies or understand triggers that might encourage and promote a reduction in car use. However on the whole, car use has intensified and is typically the preferred method of transport for most. In the main, it appears that alternative forms of transport have become marginalised or discouraged when compared to the car despite the environmental concerns and wider impacts being universally accepted and recognised.

To investigate such perceptions, this research investigates travel attitudes and behaviours of individuals who are considered to be highly car dependent along a specific urban travel corridor within an area of Birmingham, UK. It explores socio-demographic factors using a mixed methods approach that incorporated questionnaires, travel diaries and interviews. This work identified a series of transport measures conceived upon different urban demographic characteristics in order to meet different individuals' transport need along a specific travel corridor in Birmingham. A significant finding from this work indicated there was an appetite amongst the sampled participants to be willing to reduce their car use if the right transport strategies were introduced by transport stakeholders, for example, policymakers and planners. Initially the results from the questionnaire suggested age influenced car use the most however, after further research other demographic characteristics such as gender and deprivation were also shown to influence car use.

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"Experience is the name we give our mistakes" *-Oscar Wilde-*

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List of Abbreviations and Acronyms

Below is a list of key abbreviations and acronyms, which have been used throughout this research study.

- **CCC** Committee on Climate Change
- **CTC** Cyclists' Touring Club in the UK
- **DEFRA** Department for Environment, Food and Rural Affairs
- **DETR** Department of the Environment, Transport and the Regions
- **DCLG** Department for Communities and Local Government
- **CBI** The Confederation of British Industry
- **CLG** Communities and Local Government
- **COP 21** United Nations Conference on Climate Change, Paris (2015)
- **DfT** Department for Transport
- **DofE** Duke of Edinburgh. There are three awards: Bronze, Silver and Gold
- **FTS** Future Transport Strategies
- **GHG** Greenhouse gas emissions
- **NICE** National Institute of Clinical Excellence
- **NPPF** National Planning Policy Framework
- **NTS** National Travel Survey
- **ONS** Office of National Statistics
- **PCC** Police and Crime Committee
- **TfL** Transport for London
- **TfWM** Transport for West Midlands

Chapter 1

Chapter 1: Research Purpose, Role, Aim and Objectives

1.1 Introduction to the Research Study

This research study focuses on groups of individuals who have a strong affiliation to the car. It will do this by gaining a detailed insight into individual's travel attitudes and behaviour within a specific area of Birmingham, United Kingdom (UK). Currently, travel choices and support for alternative forms of transport across Birmingham are disjointed and inconsistent. It is broadly acknowledged that understanding travel behaviour is an important component of evaluating peoples' attitudes towards travel and their willingness to switch from one mode of transport to another (Beirão and Sarsfield Cabral, 2007; Thøgersen, 2006; Handy et al., 2014 & DfT, 2017). Despite extensive research studies that have investigated potential policies and strategies that might reduce peoples' car use, the car is still the preferred method of transport for most people who live in the UK (United Kingdom) (DfT, 2017).

By focusing this research on a specific group of people, the intention is this will inform future transport strategies about the travel needs and requirements of this group, in turn this will promote and enable the reduction of car use and enhance low carbon travel. Previous studies have often ignored individuals who have a strong affiliation to a car, and therefore have failed to address their travel needs and requirements. In contrast, this study specifically focuses on them. The importance of focusing on this group of individuals has been discussed throughout research studies. For example, Simma and Axhausen (2001) and Van Acker and Witlox, (2010) identified there to be strong relationship between car ownership and use, which led Mattioli et al. (2016) to argue car dependent practices are worthwhile and an important avenue for further research, and that meso-level (e.g. attribute of particular trips, activities or practices) car dependence is an area which is currently under-conceptualised and under-researched. This is typically ignored, or often not taken into consideration when conceiving sustainable transport (refer further to Mattioli et al., 2016 for a detailed description of meso-level car dependence). The Oxford English Dictionary (2017) defines the word dependent as an individual or person who is either supported by someone or who relies upon something. For the purpose of this work, this would be a car.

In order to gain a detailed understanding and insights into travel attitudes and behaviour, a mixed methods approach (i.e. questionnaire surveys, travel diaries and interviews) were adopted in this study. Each individual methodology informed the next method, for example, the questionnaire survey gained the participants for the travel diaries and interviews. The next sections of this chapter discuss the motivation, provide further detail of the justifications for conducting this study, and present the overarching aim and objectives.

1.2 Research Background and Motivations

1.2.1 Background into Transport Problems

Transport is a common act that allows for the movement of goods or people (e.g. commuting to and from a place of work or education). The effects of transport have been broadly discussed amongst researchers and practitioners (Ruby, 2015; Ricciardi et al., 2015; Jedwab and Moradi, 2015). Commentary, through either social or printed media, seems to act as a continued daily reminder of the potential challenges and restraints that transport planners, policymakers or current and future generations might face. Many inhabited areas are committed to promoting alternative sustainable modes of travel as a substitute to the car, with the intent of improving local issues, concerns or targets, for example, environmental and health benefits. However, despite these research studies have indicated that the world is currently edging towards an irreversible catastrophe regarding the environmental effects of transport (e.g. climate change and carbon emissions).

The challenges that we face today are unprecedented. For example, it is undeniable that our planet's climate appears to be changing (Chapman, 2015). Transport (as a whole) is considered as a major catalyst of fostering climate change and has a significant influence on broader environmental problems; for example, air pollution or rising sea levels (Wright and Fulton, 2005; Marsden et al., 2014; Schreier et al., 2015; Uherek et al., 2010). Furthermore, transportation is recognised to be an essential component of meeting the needs and demands of different societies. It holds the key and is the engine for future growth. Undoubtedly, transport a challenging minefield to engage in research. An extensive amount of research, debate and discussion has been undertaken in order to understand and investigate the potential extremities of transport from a social, political, economic or environmental perspective (e.g. Bellard et al., 2012; Burke et al., 2015; Balbus et al., 2013).

Therefore transport stakeholders (e.g. planners, policymakers and campaigners) are seemingly attempting to develop new and novel transport strategies to decarbonise urban areas in order to promote a reduction in car use (Pietzcker et al., 2014). It is the intention that this research study will contribute to the transport debate and research field. It will do this by recommending novel transport strategies that are likely to reduce the car use of individuals who are recognised to be the most car dependent along a selected travel corridor.

It is widely accepted that one solution to tackle these environmental impacts is to encourage a greater usage of alternative forms of transport (e.g. walking, cycling and public transport). This has been investigated by a broad range of research studies, for example, Chapman (2007); Woodcock et al. (2014); de Oliveira et al. (2013) and Xia et al. (2015). Although many of these studies have focused on people who are willing to reduce their car use, for example, individuals who cycle or walk to work. However, promoting alternative forms of transport does not mean the eradication of the car (Goldman and Gorham, 2006). It has been identified that the challenge for transport stakeholders is that most individuals perceive the car to be the preferred method of transport and promoting environmental change and altering travel attitudes is a difficult, but essential task (Brand and Thomas, 2013). On the other hand, it is worthwhile to recognise the benefits of showing awareness to the transport problems and issues that face societies in the short to medium term, as this is showing an awareness of the future transport choices, decisions and outcomes that societies can plan for. For example, an individual's perception of road congestion is a major concern in most towns and cities in the UK; from a low of 39% in 2012 to 55% in 2015 (DfT, 2017). An example of road congestion and a visual motivation for this work is provided in Figure 1.1. This figure illustrates typical morning congestion in Birmingham, UK. Appearing to indicate how the car for most is the preferred mode of transport along this selected transport corridor. This is despite alternative forms of transport infrastructure (e.g. cycle lanes) being readily available.

Figure 1.1: An Example of Morning Road Congestion (2016) - A38

1.2.2 Global and Future Transport Usage, Targets and Role

The global dependency on transport is highlighted by Schiller et al. (2010). They calculate that globally, every day, approximately 737 million personal motor vehicle journeys are taken accounting for 30 billion kilometres that accumulates to 60 billon passenger kilometres, 24 million personal flights are taken annually and cargo ships (mostly containerised) transport freight and fuel approximately 45 trillion tonne kilometres annually.

However, despite this seemingly dependence on transport, some world leaders, planners and policymakers want to develop new policies and strategies that will reduce national and local impacts of transport (e.g. global warming and air pollution). For example, environmental targets outlined in the Paris Agreement at the United Nations Climate Change Conference in 2015 (COP21) included: to halt global temperatures rising well below 2 degrees Celsius, but to pursue a rise of 1.5 degrees Celsius which, if achieved, would have a significant chance of reducing the risks and impacts of climate change (UN, 2015). Against this backdrop, the World Metrological Organization (WMO) reported that 2015 was the warmest year on record, reaching a symbolic milestone of 1 degree Celsius above pre-industrial levels. Therefore casting uncertainty regarding the reality of achieving the environmental targets discussed above. Furthermore, the period between 2011 – 2015 was recorded as the warmest five years on record and global temperatures are expected to continue to increase (WMO, 2015). However worryingly, the environmental and climate change impacts of transport have been forecast, but still many are unknown (Osborn and Hulme, 2002). Henceforth this makes for a potential difficult and challenging environment

for transport stakeholders (e.g. transport planners, policymakers or campaigners and car users).

In order to tackle car dependency and the environmental problems, researchers have reacted by informing new transport strategies or solutions (Crane and Scweitzer, 2003; Rye, 2002; Lees, 2012). For example, Tight et al. (2011) proposed future transport visions for 2030 conceived upon different parts of an urban area, and Potter and Skinner (2000) and Potter (2007) explored the impacts of advances in vehicle technology such as battery fuelled cars, flywheels and fuel cells towards replacing traditional petrol and diesel fuelled vehicles. Cairns et al. (2008) attempted to investigate transport strategies to promote a reduction in car use through specific, measureable, achievable, realistic and targetable (SMART) choices. Despite a broad range of studies that have sought to promote and enhance the potential benefits of alternative forms of transport, on the whole, the uptake of these modal choices remains stubbornly low throughout most urban areas (Vermeulen, 2002; Panter, 2013). However, some urban areas (e.g. London, Oxford or Amsterdam) seem to have a greater acceptance of the usage of alternative forms of transport.

Importantly, research studies have advocated the importance of theorising a new planning direction through transport strategies and planning (Crane and Scweitzer, 2003; Vigar, 2013; Browne et al., 2012). For example, Goldman and Gorham (2006) suggest the need to investigate new, bold and imaginative ways of conceptualising transport strategies to promote and enhance low carbon travel. However implementing or developing alternative forms of transport still remains highly contested (Banister, 2011). More specifically, some research studies have appeared to suggest that further research is required to understand and explore how travel attitudes and behaviours are influenced by demographic characteristics, highlighting factors such as wealth, age or deprivation (Chatterjee et al., 2013; Schwanen et al., 2012; Steg and Vlek, 2009; Anable, 2005; Jensen, 1999). To address these issues a research project, described in this thesis, was carried out in order to investigate travel attitudes of individuals who were considered to be highly car dependent. An overall aim and a set of objectives have been established for the purpose of this research study. They are outlined below.

1.3 Research Aim

This research ***aims*** to explore and evaluate how transport strategies might influence the travel attitudes and behaviours of individuals who have a strong association towards the car, and in turn promote and enhance the usage of alternative forms of transport.

1.4 Research Objectives

In total, there are five **research objectives** that underpin this research study. These are listed below, together with some associated research questions:

OBJECTIVE 1: To investigate how ***travel attitudes of individuals who are highly car dependent*** *vary according to different demographic characteristics at a community level.*

QUESTION 1a: Do different urban demographics influence travel attitudes?

QUESTION 1b: Do different travel attitudes exist along the same travel corridor?

QUESTION 1c: Why investigate a specific area of Birmingham and urban travel corridor and what impact could it have on this work?

OBJECTIVE 2: To ***engage with a range of transport stakeholders*** in an attempt to understand how future transport planning strategies might enable a reduction in car use.

QUESTION 2a: Which stakeholders should be included in this research sample, and what is the most suitable method of contacting and gaining a perspective of travel attitudes and behaviour habits off them?

QUESTION 2b: Will there be willingness amongst individuals who have a strong car dependency to engage within a research study that attempts to reduce car use?

OBJECTIVE 3: To evaluate a **range of future transport strategies** that might lead to a reduction in car use. In turn, informing future transport strategies to achieve local and national transport targets and to encourage decarbonised travel.

QUESTION 3a: Will future transport strategies (FTS) affect the travel attitudes of different groups of individual's?

QUESTION 3b: How will the FTS be conceived; for example, based upon previous research or hypothetical scenarios?

QUESTION 3c: Is it a realistic or an achievable target, goal or aim to want to promote decarbonised travel or is it a utopian vision?

Question 3d: How will the success of a strategy be measured and be demand and when does a strategy become successful?

OBJECTIVE 4: To **inform future transport strategies** to increase their acceptability to promote: a reduction in car use, alternative forms of transport and low carbon travel.

QUESTION 4a: Why does a transport strategy become acceptable?

QUESTION 4b: What urban characteristics will be targeted and why?

OBJECTIVE 5: Based upon the findings of this research study, make **recommendations for new transport planning strategies** that strive to promote a reduction in car use and enhance low carbon travel amongst different user groups.

1.5 Justification for the Aim of the Study

There has been an extensive range of research studies that have attempted to study the social travel attitudes and behaviour of individuals with different degrees of success (Reckwitz, 2002; Choo Mokhtarian, 2004; Anable, 2005 & Jones, 2011). Several studies have attempted to address the meaning of car dependence (Gorham, 2002; Jeekel, 2013; Lucas and Jones 2009 & Kamruzzaman et al., 2015). However, studies have typically focused on people who have shown a willingness and acceptance to be prepared to reduce their car use. Nevertheless, the car is still the preferred method of transport for most individuals in the UK today.

It is broadly accepted that some travel attitudes will be more car dependent than others. Mattioli et al. (2016) referred to 'low dependent' car actions as actions that can be carried out by either the car or alternative forms of transport. In contrast, 'high dependent' car actions, which have typically dominated modal share, are the integration between different types of travel actions. For example, an individual might travel by alternative forms of transport to collect the groceries. This might require a rucksack, thicker shopping bags, or

necessitate that individuals alter their shopping patterns and go shopping more regularly. In the extreme cases of individuals who are highly car dependent, the action (e.g. going to the supermarket to buy food) might not occur if the car was not a viable or feasible option. For the purpose of this research, an individual is defined as car dependent if they have a preference towards or rely upon their car for their modal travel over alternative forms of transport, despite them being readily available. This is different from previous studies which focus on households and individuals which simply use the car a lot (e.g. Mackett, 2003; Oakil et al. 2016 and Klein and Smart 2017).

Mattioli et al. (2016) argued further research is required to investigate the travel attitudes of those individuals who are car dependent as this is often overlooked throughout micro and macro studies and as well, this would allow policymakers and planners to consider systematically conceptualisations. Jones (2011) argued if policymakers want to successfully reduce car use they need to better understand car dependence and factors that contribute to it.

It is the intention of this research to address some of these knowledge gaps by undertaking an empirical research approach to evaluate the travel attitudes and behaviours of a specific group of road users. It will do this by exploring a specific travel community along a road corridor in Birmingham, UK. By focusing on a specific travel corridor this meant that all of the sampled participants were exposed to similar travel conditions, for example, access to public transport. This would have been difficult to achieve if a specific area had been sampled (refer to chapter 3, section 3.5).

1.6 Relevance and Importance of this Research Study

As a result of this study, it is proposed that there are four key areas: novelty, contribution, benefit and potential outcomes that will be achieved. All of which are discussed further in Chapter 2, although a brief introduction and overview is given here.

1) There appears to be a lack of understanding regarding circumstances or motivations that might encourage a reduction in car use in favour of alternative forms of transportation (Chatterjee et al., 2013). More specifically, this research study will focus on individuals who have a strong affiliation to the car. Most studies have tended to pay greater attention to and include a sample of individuals who have

shown a willingness or appetite to reduce their car use. In contrast, this research study investigates people who have been recognised to have a strong car usage and no intention to reduce their car use. It is the intention that this work will inform FTS towards promoting and enhancing the usage of low carbon travel.

2) The literature indicates a need for new research to develop new and novel transport strategies that are focused towards specific demographic groups; for example, age, gender and class (Schwanen et al., 2012; Schiller, 2010; Banister and Hickman, 2013). In order to gain a detailed insight into how demographic characteristics affect travel attitudes and behaviour, this research study focuses upon a specific area urban travel corridor in Birmingham, UK. It is envisaged that the findings of this research will benefit local transport stakeholders, such as transport authorities or transport planners. Furthermore it is the intention that the findings of this research study will be transferable and useful in other urban areas and to transport stakeholders who work outside the case study area.

3) It is widely recognised that the consumption of transport is unsustainable. Research studies predict that the current transport infrastructure may become incompatible with meeting future travel targets; for example, implications of future technology, such as advances in hydro fuels (Thornbush et al., 2013). An objective of this research study is to explore how individuals might have a willingness or acceptance to use alternative forms of transport as an alternative to the car (refer to **OBJECTIVES 3 & 4)**. Therefore it is envisaged that the findings of this research study will inform transport planners or policymakers about how to develop new transport strategies that will trigger a change in individuals' travel patterns.

4) This study intends to encourage a greater usage of alternative forms of transport amongst different demographics; for example, age, gender and deprivation. It is the intention that the findings of this study will help in achieving global, national and local environmental and wider socio-economic targets and goals; in turn, benefiting current and future generations.

1.7 Thesis Structure

In total, this research study is comprised of six additional key chapters. A brief description, purpose and summary of each individual chapter are disseminated below.

Chapter 2: Travel Strategy, Attitude and Behaviour Review – This chapter attempts to disseminate and highlight current and future transport debates, discussions, targets and strategies that have aimed to promote alternative forms of transport. It is the purpose of this chapter to present the justification and novelty of this research study. In turn, outlining how this research study will enhance transport knowledge, understanding and debates.

Chapter 3: Methodology of the Research Study – Chapter 3 focuses on the key elements that underpin the main body of this empirical study. It defines and justifies the key research methods that were conducted throughout the research and their unique contribution to this study. In total, three distinct research methods were identified which intended to achieve the research aim and objectives, as outlined in Chapter 1. Initially, questionnaires were used to gain an understanding of how FTS might affect individuals' car use, but they were also used to gain participants for the next two research stages (travel diaries and interviews). Travel diaries were then used to gain a detailed insight into the travel attitudes and behaviours of individuals who had been identified as having strong car use throughout the questionnaire survey. The participants were asked to detail one consecutive weeks travel and indicate their perceived trip cost for that journey. Finally, all of the travel diary respondents were asked to take part in a face-to-face semi-structured interview. This allowed for a detailed discussion to unfold regarding the participants' weekly travel, as detailed in their travel diaries, and permitted an investigation into which FTS would have the greatest impact on their travel attitudes and behaviour. Once key FTS were identified, the practicalities, barriers and potential outcomes were discussed with transport experts.

Chapter 4: Results and Analysis: Questionnaire Survey - Chapter 4 analyses the findings of the questionnaire survey. In total, 3,000 households received a questionnaire survey. This chapter begins to discuss the implications and impacts of the data for transport

stakeholders, how the findings could influence the aims and objectives of the study, and future transport strategy.

Chapter 5: Research and Analysis: Travel diaries and Interviews – This chapter investigates and analyses two aspects of the research methods collected for the purpose of this research study. It focuses on data collected from the travel diaries and interviews. A total of eighteen travel diaries and twenty-three interviews were conducted. In addition, this chapter discusses the practicalities and barriers that were found to exist when implementing hypothetical FTS.

Chapter 6: Research Discussion – Chapter 6 outlines the key findings of this research study. It is the intention that this chapter will provide informative information and disseminate transport strategies and measures that might be of benefit and use to different transport stakeholders from a local, national and global perspective. It is the intention that these measures will help to promote a reduction in car use and reduce the environmental and wider problems associated with high car use. It also discusses the findings from each research method, in turn.

Chapter 7: Research Conclusions – The concluding chapter disseminates the key research conclusions that have been unearthed from this work against the research objectives, as stated in Chapter 1. In addition, avenues for potential research will be discussed and outlined.

Chapter 2

Chapter 2: Travel Strategy, Attitude and Behaviour Review

2.1 Introduction

This chapter will discuss and evaluate aspects of transport research that have attempted to promote, encourage or engineer a change in travel attitudes and behaviour. The chapter will develop on the previous chapter by aiming to disseminate research gaps and avenues for further research within the field of transport; in turn, providing justification for the contribution of this research study. The proceedings sections to this chapter will then provide a review of transport research, need and requirement from a local, national and global perspective, and define the meaning of transport stakeholders and alternative forms of transport for the purpose of this work.

It is broadly acknowledged that investigating travel habits and attitudes has been widely discussed amongst researchers, practitioners and scholars (Behrens and Mistro, 2008; Gärling & Axhausen, 2003 and Jones and Sloman, 2003). However, many research studies have often overlooked, failed to investigate, or almost completely ignore individuals who are car dependent and the relationship between macro-, micro- and meso-levels of car dependence (Mattioli et al. 2016). However, a limitation of Mattioli et al. (2016) research was it focused on different shopping trips (e.g. for food and leisure) and ignored day to day trips (e.g. going to work or taking children to school). This is in contrast to this work, which adopts a holistic approach to car trips by including all and not isolated or focusing on one to understand how transport measures might be implemented to reduce car use. Based on a review of the literature, macro levels include: car reliant locations, a car reliant society (Lucas and Jones, 2009) or car dependent locations (Jeekel, 2013); Meso levels include: car dependent trips (Stradling, 2003), activities (Jeekel, 2013) or related to lifestyle (Lucas and Jones, 2009) and micro levels include: car dependent people; car dependence of individuals or addicted car users (Lucas and Jones, 2009 and Stradling, 2003).

Dodson and Sipe (2008) also suggest researchers have failed to investigate energy dependency within the transport system, with there being a lack of attention from scholars relating to energy use throughout the social process, which has received little attention in research studies. Aldred et al. (2017) suggest if planners and policymakers want to make a

real difference to encouraging and promoting alternative forms of travel in further research studies, they must be focused on the groups that are under-represented (e.g. individuals who have a strong association towards the car) as they are a necessary element to encourage effective modal change. In the main, understanding dependency has focused more on the influence of technological advances (Lenzen et al., 2004; Troy et al., 2003).

The empirical nature of this research study is unique and novel as it will examine the travel habits of a specific group of road users who are car dependent at a community level and will focus on different aspects of transport (e.g. walking, cycling and public transport use). This is in contrast to previous studies, which have typically focused on regional or national travel habits (e.g. Dill & Voros, 2007; Flamm, 2009). Furthermore, Willis et al. (2015) indicate that researchers often combine transport modes such as walking and cycling. They argue future research would benefit from studying how travel habits and attitudes might be influenced by investigating modes of transport separately, as there is significant difference between how modes of transport are perceived. It is therefore the intention of this research study to enrich and contribute towards the transport field by unearthing and informing new transport strategies, with a specific focus on road users who are car dependent. For the purpose of this research a community level refers to a group of people living along a specific travel corridor. An initial starting point for this chapter will be to review some of the key definitions for the purpose of study and provide a brief historical overview of transportation.

2.2 Key Definitions and Historical Overview

2.2.1 Defining Sustainability

The term ‘sustainability’ is typically used in general day-to-day conversation and throughout printed or electronic media; e.g. social media. It almost seems acceptable to use the term sustainability for nearly any context as it is used for a variety of different rhetoric. Yet still it seems that the term sustainability often lacks clarity and distinct definition (Elliott, 2012). It is widely accepted that the term sustainability has become engrained across a wide range of academic discussion, and therefore its scope and characteristics have become broad and far reaching (Hannon and Callaghan, 2011).

The term sustainability has become embedded into a broad range of research studies; some examples include, health (Cavoli et al., 2014; Pucher and Dijkstra, 2003) or the association between the built environment and equity (Lucas et al., 2001; Crane and Scweitzer, 2003). Research suggests that there is no singular, universal or unanimous definition of the term sustainability as there are many different nuances (Litman and Burwell, 2006; Heinen, 1994; Jabareen, 2008; Petersen and Snapp, 2015). Therefore, understanding and defining sustainability has become interwoven across a broad range of research disciplines (Miller, 2013; Thompson, 2010; Wiek et al., 2011).

The distinct lack of an all-compassing definition has led to there being over 140 alternative modified definitions that conceptualise the meaning of sustainability (Santillo, 2007). Furthermore, Pearce et al. (2012) describe sustainability as a subjective term that is highly complex and often results in further complexity or confusion when stakeholders attempt to implement or develop sustainable transport. For the purpose of this research study, a stakeholder is a person or group of individuals who share a common interest in something, and therefore they have responsibilities to it and its success. In specific reference to this research study, this may include planners, policymakers, campaigners and car drivers.

Ciegis et al. (2015) and other researchers (e.g. Mebratu, 1998; Rogers et al., 2012; Reid, 2013) argue that the Brundtland Commission report entitled "*Our Common Future"* is the broadly accepted definition of sustainable development:

> *" development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987:15).*

However, since the Rio summit in 1992, some authors argue this definition has been superseded and that sustainability rather reflects the development to incorporate and consider the importance of global management and technology to meet future environmental targets.

> *"Challenge for global management, with intelligent, scientific, and instrumental management of the earth perceived as one of the great challenges facing humanity" (Jabareen, 2008:187).*

Larsen et al. (2014) have shown that a growing awareness to promote sustainability (particularly since 1980) has led to greater discussion and debate amongst researchers. A greater emphasis has therefore been placed on human and natural requirements; for example, an awareness and appreciation to consider an individual's needs and wants before conceptualising sustainable development. It would be worthwhile to consider the relationship between sustainability and other research disciplines. This concurs well with previous research that suggests transport stakeholders (e.g. policymakers, planners and campaigners) must take a broader approach towards the challenges they face (e.g influencing travel attitudes and reducing carbon emissions). Hickman (2010) has indicated that the transport challenges are on an unimaginable scale.

2.2.2 Delivering Sustainability

The concept of delivering and achieving sustainability is considered the benchmark for development on a transnational scale. This notion is reconfirmed by the United Nations (UN) who indicated sustainability to be a key 'Millennium Development Goal' (Abulfotuh, 2011). Promoting the concepts and values of sustainability has become widely recognised as a key ingredient of encouraging and achieving decarbonised travel (Anable, 2005; Brand et al., 2012; Stern, 2009; Goodwin et al., 2004). A principle aim of sustainability is to promote a reduction in car use (Redman et al., 2013). However, research studies suggest that current transport strategy fails to provide a clear and effective way to promote sustainable development. Gudmundsson et al. (2012) highlight that the UK needs a clear transport strategy and a conceptual framework in order to concisely support future sustainability. For the purpose of this research, the term sustainability refers to promoting a greater usage of alternative forms of transport (e.g. cycling, walking or public transport services) for those in favour of the car. This has the benefit of an enhanced management of resources with the intention to promote development that meets the needs and requirements of the current generation, without affecting future generations.

This definition was conceived based on the two definitions outlined above. Schiller et al. (2010) advocate that before transport stakeholders conceptualise future transport strategies (FTS), it is worthwhile to consider three broad objectives.

1) To meet an individual's access needs in parallel with consideration for human and ecosystem health, without polarising present and future generations.

2) To offer a holistic range of transport modes which must be affordable and efficient that help towards supporting a vibrant economy.

3) To limit the use of natural resources enabling a limitation of harmful emissions and waste that places a greater emphasis upon reuse and recycle.

Additionally, Schiller et al. (2010) outlined the characteristic differences that might exist between promoting and encouraging sustainable transport compared to business as usual (i.e. no change to travel attitudes and behaviour), shown further in Table 2.1.

Table 2.1: Sustainable Transport vs. *Obsolete Transport Strategies*

Sustainable transport	***Obsolete Transport Strategies (i.e. no change to travel attitudes or behaviour)***
Preference towards accessibility and quality (closer, better)	Greater emphasis on mobility and quantity (more, faster)
Multi-modality	Emphasis on one mode of transportation, regardless of individual's needs and requirements
Greater interconnections between different forms of modes	Poor connections between different forms of modal transportation
Endeavour to interrupt and reverse harmful trends	Accommodates and accepts trends
Implements backward casting (preferred vision) to planning and provision (deliberate and decide)	Demand stimulates new plans and builds (forecast and provide)
Management of transport and travel demand	Travel demand drives road expansion but ignores many social and environmental costs
Includes full costs within planning and provision	Often transport planning excludes environmental, social and planning areas
Endeavours to integrate transportation through planning with other urban areas	

2.2.3 Transport Background

Issues and concerns embedded, associated or linked towards transportation surrounding the provision of effective transport have long triggered and been the catalyst for debate. These discussions and debates regarding the development and promotion of sustainable transport can be traced back to the early twentieth century (Stradling et al., 2000). Transport stakeholders (e.g. planners, policymakers and car users) have developed their knowledge and understanding in relation to sustainable transport by evaluating individual's travel attitudes and behaviours. For example, the UK Government, in July 1998, integrated transport White Paper `A New Deal for Transport: Better for Everyone' (DETR, 1998) which recognised the extensive challenges to delivering sustainable transport and the importance of engaging public and private sectors. More recently, in 2012 the Department for Communities and Local Government (CLG) published the National Planning Policy Framework (NPPF) (CLG, 2012). Central to this report was the importance of promoting sustainability development that maximised the usage of public transport, such as walking and cycling. Standardised principles have become conceptualised in order to inform transport stakeholders of hypothetical solutions and strategies to achieve effective sustainable development (Lombardi et al., 2011). For example, Pfaffenbichler and Brezina (2015) investigated the percentage of cycle parking required to enable an increase in cycling. Their research was based upon cycling in Vienna. Other research studies have explored the regulation associated with the design of cycle facilities and the built environment (e.g. equipping buildings) (Celis et al., 2008; Sigrist, 2008).

New Urbanism is an example of how sustainability has been previously promoted through policy (Goodwin et al., 1991; Jabareen, 2006). The planning system is considered a key component towards achieving sustainable targets and goals (Cowell and Owens, 2006). New Urbanism aimed to create pedestrian-orientated spaces that enhanced social equity, and to alleviate the environmental burden from transportation (Trudeau, 2013). However, critics argue transport strategies developed through the New Urbanism movement are merely a disguise towards achieving effective sustainability, and they are often described as armchair strategies (e.g. strategies that promote limited change) (Grant, 2006). Rees (2003) argues that policies associated to New Urbanism often ignored the theory of social science and empirical engagement and rather focused on marketing and manifesto. This suggests

promoting sustainable transport is highly convoluted and complex, with different stakeholders having a holistic range of opinions in order to develop sustainable strategies. Researchers further indicate strategies developed under New Urbanism offered limited flexibility, concepts or desire that makes for a difficult, if not impossible, challenge to move towards the visualisation of a sustainable transport urban realm (Owens, 1995).

Throughout the 1960s, 70s and 80s the popularity of car travel increased. Transport policymakers sought to implement transport strategies that 'predicted and provided' in order to accommodate growing travel demands (Goodwin, 1993). Car usage continued to increase throughout the twentieth century (DfT, 1996a). The car is now recognised as the preferred method of transport for most individuals and accounts for more journeys than any other single mode of transport in the UK (Oxley, 2015). However, currently, policymakers take a different approach towards promoting or developing transport strategies. In the main, policymakers favour a 'predict and prevent' approach towards meeting travel demands (Owens, 1995; Goulden et al., 2014; Martens, 2006). Furthermore, in order to achieve effective transport intervention and implementation, researchers have suggested key stakeholder engagement must be exercised in unison with financial support (Mathur et al., 2008; Few et al., 2007).

Aldred et al. (2016) found funding for alternative forms of transport was inadequate to encourage a modal change away from the car. The importance of funding has been outlined by Cyclists' Touring Club (CTC), a national cycling charity in the UK. They found that a minimum of £10 per head should be spent annually on cycling in the UK, rising to £20 if cycle targets are achieved. However, this is still below other European countries, for example, the Netherlands spend an estimated £24 per head per year on cycle infrastructure (CTC, 2015). Although there is still considerable doubt about this approach as the UK is in a period of austerity and with economic uncertainty surrounding Brexit and discourse (Hobolt, 2016) who would pay people to cycle is highly debated, as discussed by Krugman (2009).

Despite this, there is still yet no sign from government or policy makers to redirect any resources that have previously been allocated for road-building in favour of alternative form of transport infrastructure projects at levels required to make a real difference, echoing the requirement for further research to justify its significance (Tapp et al., 2016). It

is typical that financial support is provided by central government or private investors - although Terry (2000) argues government funding often lags behind transport demand. This research further argues in order for transport planners and policymakers to achieve effective stakeholder engagement (which has been acknowledged as a necessary prerequisite to create effective transport policies) public participation and engagement must occur. This concurs with previous research by Jarvis et al. (2012). The authors found that stakeholder engagement was a critical component in neighbourhood regeneration in Coventry.

However, in the main, it is argued that typically transport stakeholder engagement is merely tokenistic and a tick box exercise where developers engage because of legal obligations rather than a willingness to listen to individuals concerns and opinions (Rydin and Pennington, 2000; Stewart and Lithgow, 2015). If future transport planning strategies are going to stem the projected transport usage and CO_2 emission requirements researchers, argue there is a greater need to consider the impact of stakeholder engagement in order to inform new transport planning strategies. Friman et al. (2013) argue to effectively inform future transport planning strategies, research studies must apply a broad-church approach by engaging with different groups of individuals (e.g. members of the general public, politicians and policymakers) in order to gain an understanding of the travel needs and wants of different individuals. This research is an attempt to achieve this and begins to present justification by combining numerous research methods together to understand travel attitudes and behaviour.

2.2.4 Current Transport Spending and Usage

Total public transport expenditure (e.g. maintenance and new infrastructure projects) in the UK was £20.6 billion for 2014/2015 (DfT, 2015). Of that, 45% was spent on road projects, 14% on local transport, 37% on railways and 5% on others (e.g. walking and cycling). Research by the Department for Transport (DfT) (2014) indicated the total distance travelled in the UK between 1952 and 2014 as a result of cars, vans and taxis increased from approximately 50 to 700 billion passenger kilometres. In the same time period, it was reported that kilometres travelled by alternative forms of transport (e.g. rail or cycling) had remained relatively static or decreased; refer to Figure 2.1 (DfT, 2014). Therefore, this may

justify why more public expenditure is spent on road infrastructure projects, as there is a greater public usage compared with other transport methods.

On the other hand, if alternative transport modes are unfunded it is perhaps reasonable to expect the uptake will remain low and underutilised, highlighting the limitations of centralised funding. Thus, it is potentially an unrealistic and utopian to want to achieve a greater usage in alternative forms of transport from a national perspective. To a further extent, if future transport predictions come to fruition (e.g. car accessibility and use) this suggests that a new nexus towards transport strategies must evolve. New research must seek to inform Future Transport Strategies (FTS) which in turn attempt to inform how to influence travel attitudes of different groups of individuals to favour a greater usage of alternative forms of transport. In addition, the above public expenditure contrasts with previous research that appeared to suggest that planners could no longer build their way out of road congestion (discussed later in this chapter).

It is broadly accepted there are a growing numbers of cities (both in the UK and on a worldwide scale) which are attempting to implement transport policies to foster, promote, or engineer a reduction in car use. Transport stakeholders, such as planners and policy makers, have often struggled to identify the most effective ways to spend their limited resources (Handy et al. 2014). Handy et al. (2014) highlight a current research gap exists in transport studies by suggesting transport policymakers and planners need new research to inform them of the best strategies to implement in order to encourage a reduction in car use and promote low carbon travel. It is an intention of this research study to respond to this knowledge challenge and gap by informing transport stakeholders of the most likely transport strategies that might reduce individual's car use.

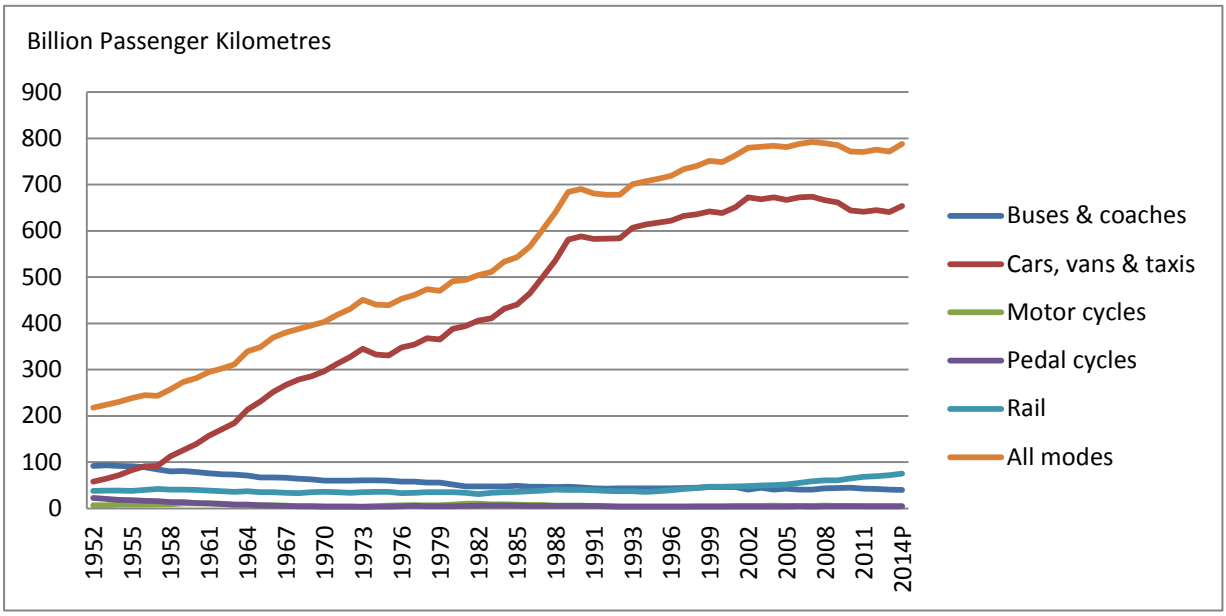

Figure 2.1: Passenger Transport Mode from 1952 to 2014

Source: Adapted from DfT (2014)

2.2.5 Current and Predicted Transport use in the Case Study Area

It is predicted, like many urban areas in the UK, the car use in Birmingham will increase within the coming years. Birmingham is located within the region of the West Midlands in England. It is projected that by 2035, 81% of households in the West Midlands will have access to a car (Centro, 2012). This correlates well with Census data (2011) which found the percentage of households without car access has fallen. Furthermore, since 1971 households without access to a car within the West Midlands decreased from 51% to 31% (Centro, 2013). Figure 2.2 compares census data from 2001 with 2011 and indicates that Birmingham and its surrounding areas have all experienced greater levels of car accessibility. It is therefore reasonable to predict that the car will continue to remain the preferred mode of transport within Birmingham and other urban areas within the forthcoming future, unless new transport strategies are introduced, as it appears that current strategies are not reducing individuals car use. Furthermore, without significant advances in technology and a reduction in the affordability of green cars, e.g. electric cars, it is reasonable to assume local environmental targets will be not be achieved, unless actions are taken to influence individual's travel preferences.

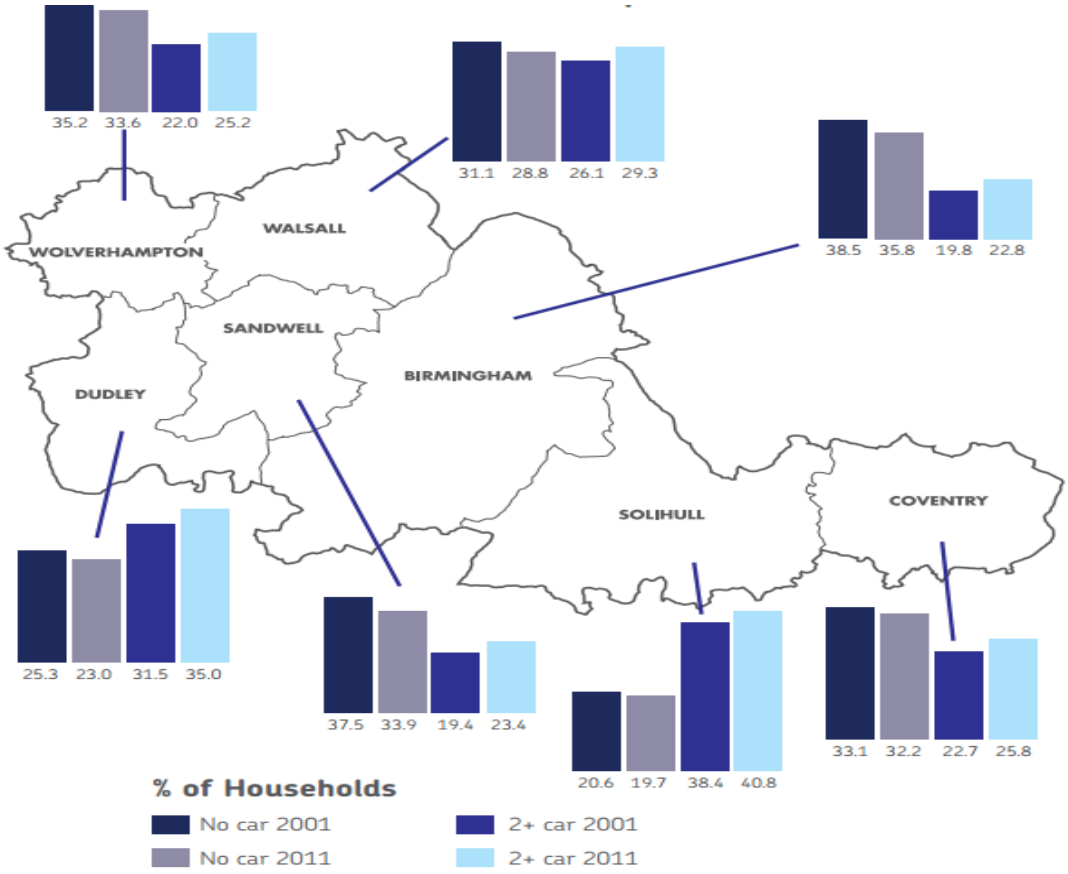

Figure 2.2: Car Ownership 2001-2011 (West Midlands)

Source: Adapted from ONS (2001) & (2011)

2.3 Transport Strategies

It has become increasingly important to implement effective strategies to reduce car usage for environmental benefit (Stern, 2006). Consequently, a large amount of research has been carried out to suggest various strategies, theories or methods that might influence attitudes towards car use (e.g. Beirão and Sarsfield Cabral, 2007; Anable, 2005; Cullinane, 2002). In addition, the British Social and Survey (2015) has published guidance of transport studies and behaviours, the report is entitled: 'Public Attitudes towards Transport Provides a Clear Overview of Key Travel Attitudes and Behaviour from a UK Perspective. Transport planners and policymakers are increasingly seeking to investigate new alternative strategies to influence travel attitudes, car dependency and traffic levels through smarter choices; i.e. promoting car clubs or travel awareness campaigns (Cairns et al., 2008).

2.3.1 A review of Transport Strategies

Transport strategies that have been illustrated in research studies might include: 'hard', 'soft' and to a lesser extent 'Knowledge' (Möser and Bamberg, 2008; Bamberg et al., 2011; Goodwin et al., 2004; Santos et al., 2010). For the purpose of this research, key terms such as policies, strategies and measures have been adopted from the Oxford English Dictionary (2017) and are defined below:

- **Policy -** A course or principle of actions that have been adopted or proposed by a specific organisation or individual. The principle action is to encourage a reduction in car use in favour of alternative forms of transport.

- **Strategy -** A plan of actions designed to achieve long-term targets or an overall aim. The overall aim or intention would be to implement strategies that encourage a reduction in car use amongst individuals who have a strong affiliation to the car.

- **Measures -** Typically used to ascertain the size, amount, or degree of (something) by using an instrument or device marked in standard units. For this research, it is measured by the likely influence they will have towards affecting an individual's car use. The greater the reduction in car use, the more successful a specific measure is perceived.

A broad definition and outline concerning each different transport strategy is discussed in turn below. It is worth highlighting, that in the main, policymakers favour implementing soft as opposed to hard transport strategies. This is broadly acknowledged due to the financial burden that is often associated with hard strategies, and they typically take a long time to implement (Schade and Schlag, 2003).

1) ***Hard transport strategies*** characteristically include engineering towards a modal change or a physical change to the transport network in order to influence individuals travel attitudes or behaviour. For example, traffic engineering, controlling road space or implementing road pricing schemes such as toll roads (e.g. M6 Toll or M25 Dartford Crossing) or congestion charges (e.g. London, Stockholm or Singapore).

2) ***Soft transport strategies*** attempt to promote or encourage a change in travel attitudes, rather than forcing individuals to change their modal use. Soft transport strategy examples were discussed and outlined by Cairns et al. (2008). They included workplace travel plans, school travel plans and personalised travel plans.

3) ***knowledge transport strategies*** are highlighted by Santos et al. (2010). They describe strategies that are developed and implemented on the basis of research and development that provides incentives and novel solutions to achieve the overarching aim of creating low carbon travel. New technological advances are used that intend to reduce the environmental impacts of transport (e.g. biofuels, hybrid internal combustion engines, plug-in hybrid and purely electric vehicles, powered by either fuel cells or batteries). The importance of promoting new technologies for the transport sector is highlighted by Stern (2006). He indicates as global population increases, travel demand will increase and therefore new technologies are required to improve transport efficiency and reduce carbon emissions. Santos et al. (2010) describe how countries such as Japan have improved transport efficiency of passenger and freight transport.

However, it is worthwhile to recognise that research studies argue the rise in technological solutions will be one solution for the current transport dilemma. The rise in technological solutions towards transportation issues has been widely discussed in the academic literature (e.g. Popp, 2004; Romm, 2006 & Chapman, 2007). Even though technology might not solve all transport related environmental problems (e.g. GHG emissions), it is reasonable to identify that technological solutions are a fundamental component towards achieving a reduction in GHG emissions.

Although, technological solutions should not be considered the sole solution, as they are poorly perceived when compared to incumbent technologies and it is broadly accepted further investment required. For example, research studies suggest that electric cars are one solution to tackle environmental concerns from transport. Nevertheless, such strategies are widely considered as too expensive and inaccessible to the mass market when compared to traditional fossil fuelled powered vehicles (Larson et al., 2014; Green et al.,

2014). It would therefore be reasonable to suggest this indicates that some forms of alternative transport (e.g. electric cars) are an unsuitable substitute to meet the individual travel needs and requirements of the current day traveller. Furthermore, this does not solve road congestion that appears to be a permanent feature of the roads and within urban areas of the UK. Brand et al. (2012) suggest future research should attempt to explore how to potentially influence individual travel attitudes to encourage a reduction in car use in order to reduce road congestion. It therefore seemed logical to focus this research study on traditional petrol powered vehicles rather than newer cars such as electric or hybrid, as in the main, petrol powered vehicles are predominantly used for day-to-day travel along the specific travel corridor this study investigated.

2.3.2 Implementing Transport Strategies

Despite what appears to be a clear distinction and clarity concerning transport strategies, the development or implementation of them has created much dilemma and debate for many years. Rittel (1973) advocated conceptualising transport strategies as 'wicked problems' as it was recognised that individuals will have different travel attitudes and requirements. Therefore there will always be winners and losers. Cairns (2004) Touwen (1999) and Rye (2002) investigated the influence that soft transport strategies had on different individual's travel attitudes and behaviours. They found that some strategies were favoured more than others. Similar findings were obtained by Fujii and Gärling (2003) when they considered the influence of a range of hard transport strategies towards different groups of individuals' travel attitudes and behaviours.

A further problem to encourage a change towards alternative forms of transport was outlined by Steg (2005). Her work was based in the Netherlands. She indicated it was more than the ability to move easily from one place to another; rather the car is conceptualised as a symbol of status, power, and superiority. This reinforces the dependency individuals might have towards car transport. Steg (2005) concluded by suggesting that future research should consider a multitude of individuals' social and affective motivations when developing or informing in transport strategies. This work concurs with Dargay (2008) who indicated despite introducing increased car taxation and subsidies individuals perceive car use as a necessary act. Handy et al. (2005) also found that individuals are no longer driving out of

necessity but rather by choice, and therefore driving is not considered by most individuals as an act of leisure rather than a necessary act to move from one place to another. Numerous studies have suggested there are difficulties in changing individuals' car use habits and behaviours in favour of alternative forms of transport (Domarchi et al., 2008; Gardner and Abraham, 2007; Hinde and Dixon, 2005).

On the other hand, it is acknowledged that research studies such as Jensen (1999) and others, for example, Lorenzoni et al. (2007) suggest there is a potential willingness amongst individuals to be prepared to reduce their car use if the right alternative forms of transport were developed that met their needs and travel demands. This concurs well with other research studies, for example, Caulfield (2014) who researched cycling in Dublin. The findings indicated if substantial improvements are made to infrastructure provisions to enhance cycling, for example, segregated cycling lanes; this would increase individuals' desire to cycle to work, and most notably amongst females. This further supports the need for new FTS to be developed in order to promote and encourage the usage of alternative forms of transport and to target policies towards individuals who have a willingness to reduce their car use.

2.4 Future Transportation Goals and Targets

Issues concerning transportation have become a global problem. Air pollution and high levels of congestion are all recognised to be associated with high levels of car dependency. The Royal College of Physicians (RCP) estimate that approximately 40,000 deaths are attributed to outdoor air pollution, costing £20billion to UK health and business services (RCP, 2016). It is broadly accepted that attempting to 'build our way out of trouble' by, for example, building new roads and creating more car parking spaces is not a sensible option (Cairns et al., 2008). The transport sector as a whole (e.g. land and air transportation) has been widely considered to be one of the greatest contributors towards global climate change (GCC) (Balbus et al., 2013). The Intergovernmental Panel on Climate Change (IPCC, 2013) reported there to be significant evidence to suggest (above the 95% confidence level) that humans are the main cause of the current global warming. Therefore influencing individuals' travel attitudes to favour low carbon travel has been considered as one way of tackling environmental impacts. Research studies frequently describe transport planning as

being at crisis point, suggesting planners have often miscalculated the key challenges that face urban areas (Banister, 2008; Banister and Hickman, 2006; Wickham, 2006). A solution to promote effective transport strategy was outlined by Banister (2008). He suggested that if effective future transport planning strategies are to evolve, transport research must explore the travel habits of different groups of individuals, in order to promote effective strategies that could reduce their car use. This research study therefore focuses on a specific group of road users that are highly car dependent. It was considered they were the most likely group of individuals that have the greatest environmental burden. Furthermore, if FTS were implemented successfully with this group of individuals, it is logical to assume that policymakers and planners would be more likely to achieve local, national and global sustainability targets and goals (e.g. reduction in carbon dioxide). The importance of this is discussed in the next section of this chapter.

2.4.1 European and Global Transport Targets and Challenges

The European Union (EU) has set a future climate change target to limit global temperatures to 2^{o}C above pre-industrial temperatures (EuropeanCommission, 2015). Some of the most ambitious cities include Berlin and Hamburg, which are both targeting a greenhouse gas (GHG) emissions reduction of 40% in 2020 and 85% and 80%, respectively in 2050 (Heidrich et al., 2016). However to achieve these targets it has been argued that deep structural change to the current transport system must be developed to deliver a substantial and sustained reduction in GHG emissions (Geels, 2012). Transportation accounts for 23% of global energy related to carbon dioxide (CO_2) emissions; three quarters of which are generated as a direct result of road transportation – this is predicted to treble by 2050 as travel demand increases (Graham-Rowe et al., 2011). Despite efforts made by successive governments to tackle CO_2 emission levels (either on a national or worldwide scale) and the environmental impacts of transport, there still appears to be concern and debates.

In 2013, CO_2 concentration measured at Mauna Loa, Hawaii crossed a symbolic milestone of 400 ppm (parts per million) (Bala, 2013). This is a measurement of the mass of a chemical or contaminant per unit volume of water. The decade between 1995 – 2005 witnessed the greatest growth annually in ppm CO_2 concentration (averaged 1.9ppm pa) – resulting in a projected CO_2 concentration to rise to 550 ppm by 2050 (Hickman et al., 2010).

These projections are against the backdrop of the recognition that the transportation sector (as a whole) still today remains an underperforming industry towards reducing CO_2 emissions (Hickman et al., 2010). The impacts of high CO_2 concentration include climate change, land and food scarcity and health effects. In addition, research suggests that by 2030 cars will be the third largest contributor to global disease (refer to Figure 2.3). More worryingly, research has indicated that it will be primarily individuals of marginalised communities who will suffer the greatest burden (e.g. Mitchell and Dorling, 2003; Woodcock and Aldred, 2008). In addition, road traffic accidents are predicted to become one of the three leading causes of death by 2030, based on future projections by the World Health Organisation (WHO) (see Figure 2.3). Furthermore it is estimated that by 2050 road deaths will be the biggest global killer (Cairns, 2016).

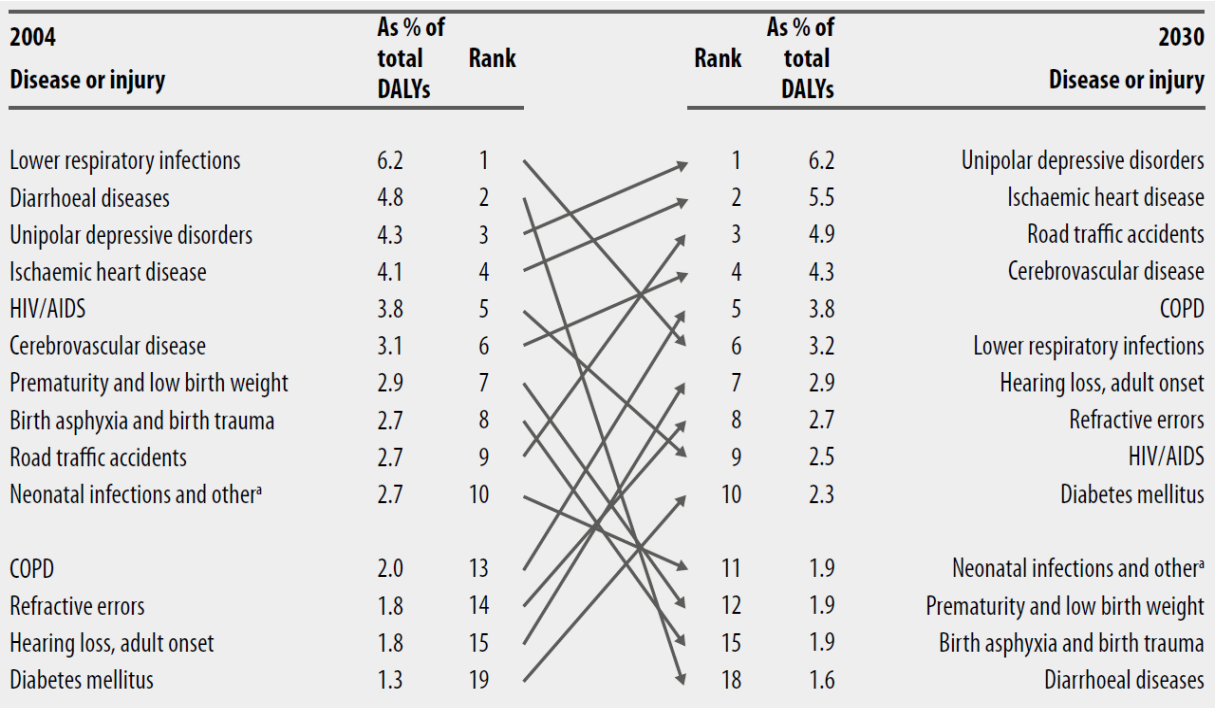

Figure 2.3 World Changes to Causes of Disease or Injury from 2004 to 2030
Source: WHO (2008)

2.4.2 Transportation: A UK Perspective

Current transport planning strategies in the UK appear to indicate a shift towards promoting travel attitudes that favour alternative forms of transport. Policymakers and planners have strived to reduce car usage, however too often transport strategies have

been criticised for being too spontaneous and lacking knowledge about why individuals might be heavily dependent upon the car for their daily travel needs (Bulkeley and Rayner, 2003). It is accepted that within the current transport context most people are dependent upon the car for their daily travel needs (Anable, 2005; Ibeas and Cecin, 2011). To some extent, moving freely from one place to another is taken for granted by most individuals (Buehler, 2010). Therefore planners and policymakers have been instinctively aware of the importance of reducing car dependency by promoting alternative forms of transport (Beirão and Sarsfield Cabral, 2007). Despite research studies that have attempted to encourage a greater usage of alternative forms of transport the uptake still remains stubbornly low throughout most regions of the UK (Ogilvie et al., 2004; Pucher et al., 2010; Yang et al., 2010; Panter, 2013; McEldowney et al., 2005; Aldred et al., 2016). This is despite the benefits of alternative forms of transport being widely discussed, acknowledged and accepted. For example, Lyons and Urry (2005) highlight that travelling by some alternative forms of transport represents an opportunity for individuals to be more productive with their time as individuals require less effort and concentration than commuting by the car.

This is against the backdrop of the UK Census in 2011, which reported that 70% of all commuter trips are made by the car, compared to 2% by bicycle in the UK (Census, 2011). This indicates that most people are dependent upon their car and new transport strategies are needed to promote the usage of alternative transport modes. It is worthwhile to highlight that, historically, walking and cycling were together the most common form of transport and this perhaps, on the whole, suggests people have become disenfranchised with alternative forms of transport, or that alternative transport no longer meets an individual's needs. For example, 40% of workers between 1890-1930 walked to work and most notably between 1920-1950 bicycles were the single most popular form of transport (Pooley and Turnbull, 2000). Today, studies have found the opposite; indicating that some forms of alternative transport (e.g. cycling) represent the minority of commuter trips, with particular reference to the UK (Aldred, 2012; Aldred et al., 2016).

The popularity of car travel has given rise to a growing emphasis being placed on new research that informs future transport planning strategies in order to increase an individual's acceptance towards using alternative forms of transport (Eddington, 2006). In

turn, it has been recognised that new research is required to understand how to promote potential solutions to decarbonise travel and encourage pro-environmental behaviour (Steg and Vlek, 2009). The promotion of sustainable strategies has become embedded within the political spectrum either at the local or national governmental agendas or debates (Banister and Hickman, 2013; Gudmundsson et al., 2012; Goodwin, 2008; Santos et al., 2010). Some examples of policy interventions to promote a greater usage of sustainable transport within the last decade include: Climate Change Act (2008); Creating Growth, Cutting Carbon: Making Sustainable local Transport happen (2011) or; a governmental white paper entitled Cutting Growth Cutting Carbon (2011) which introduced the local sustainable transport fund and the Infrastructure Act (2015) that commits the government in England to a 'Cycling and Walking Investment Strategy' in England.

Despite this, the usage of alternative forms of transport remains extremely low, questioning the effectiveness of the transport strategies. For example, it is generally accepted that in Britain (and throughout many other societies), there has been a long-term reduction in the usage of walking, but more particularly cycling (Tight, 2016). Furthermore, the UK government announced through the National Infrastructure Plan (2013) that it is committed to making the largest investment in roads since 1970s, spending £15.1 billion in strategic roads by 2021 due to a projected 43% increase of road traffic by 2040 (HMTreasury, 2013). This furthermore conflicts with previous and other transport strategies (outlined in this chapter) that suggested transport stakeholders can no longer build their way out of congestion, and this could jeopardise future transport targets or strategies that aim to reduce car use.

For example, the UK government announced through the Carbon Plan (2011) an 80% reduction target in GHG emissions by 2050 (based upon 1990 levels) - currently the transport sector contributes 25% of the UK's CO_2 emissions (Brand et al., 2012). This suggests (based upon current trends and future predictions) that the transport industry needs to play a major role in helping to achieve this target (Geels, 2012). It is forecasted that CO_2 emissions from transportation will further rise over the coming years and decades (Tight et al., 2007; Piecyk and McKinnon, 2010). In 2011, surface transport accounted for 111 metric tons of CO_2 ($MtCO_2$) of which 58% was from car use. The Committee on Climate Change (CCC) has set future targets to reduce surface transport emissions to 89 $MtCO_2$ by

2020, and 67 $MtCO_2$ by 2030 (CCC, 2013). Encouragingly, recent research reported that, overall, GHG emissions decreased between the period of 1990 and 2007 within the UK by 21%. However, in that same time period, GHG emissions rose by a further 11% from transportation (Marsden and Rye, 2010). It is predicted GHG emissions from transportation will continue to rise by a further 5% by 2020 as the demand for private car use continues to increase. The transport sector, as a whole, is the only sector to predict an increase in CO_2 emissions from 1990 to 2020 (Marsden and Rye, 2010). In addition to the environmental, social and political impacts of transport, the economic impacts should not be discounted. The Confederation of British Industry (CBI) estimated road congestion accounted for 19.2 seconds per mile lost for drivers in the UK in 2010; this is predicted to worsen to 32.3 seconds by 2035 (CBI, 2015).

2.5 Perceived Barriers towards Transport Strategies

There still remain potential barriers towards the implementation and development of transport strategies that might promote a reduction in car use with critics skeptical (Lorenzoni et al., 2007). Banister (2008) suggests that there is a growing body of transport research that implies the implementation or aims of transport strategies are rarely achieved and fail to meet an individual's expectations. Other research suggests that there is limited willingness from governments to enforce individual or industrial behavioural change for environmental benefit or justification (Hinchliffe, 1996; Janssen and Estevez, 2013).

2.5.1 Political Constraints and Resistance

Gow (2006) and others argue there has been political reticence towards transport policies that favour alternative forms of transport; for example, due to electoral protest and often the close relationships that successive governments share with industry - thus highlighting the potential external factors that might influence FTS to promote a reduction in car use. Examples of political protest include: fuel tax escalator in 2010 (Dresner et al., 2006); Edinburgh road users charge (Gaunt et al., 2007); and proposed congestion charge schemes e.g. Manchester (Schaller, 2010; Vigar et al., 2011). Watson and Scott (2009) investigated the impacts of the fuel protest in the UK from an economic and social perspective. They discussed the most recent protest in Grangemouth, Scotland (2008). This led to the rationing of fuel and the requirement of additional fuel tankers to supply fuel.

Further fuel protests led to the closure of 50% of the UK's petrol stations within just 5 days with health and business services affected.

A potential problem of promoting new transport strategies is that not all strategies will have the same effect on individual travel attitudes and behaviour in all areas. For example, The British Social Attitudes Survey (2013) found 20% of British people considered road congestion to be a problem on the motorway, compared to 45% who identified it to be a major problem in urban areas. Therefore, it would be more worthwhile to implement congestion charging in urban areas as opposed to motorways. It is broadly considered that a fundamental limitation with transport strategies is that, on the whole, most governments (when taking office) often want to focus on economic growth and short-term targets rather than long term transport targets that promote a change in travel behaviour and attitudes and potentially requiring cross party support, which is highly unlikely. Research studies indicate that in the main, in order to influence successful strategies they must occur over decades and therefore strategies typically start and stop as governments change (Lorenzoni et al., 2007).

2.5.2 Individual Perception and Perceived Narratives

Furthermore, some researchers suggest that an individual's perception and awareness of climate change and environmental problems do not correlate with their actions. For example, the Department for Environment, Food and Rural Affairs (DEFRA) found that there is extensive research which highlights that only 1% of the public (in the UK) have not heard of 'global warming' or the 'greenhouse effect', with most people suggesting they are aware of the potential causes of climate change and that it concerns them (DEFRA, 2002). Poortinga and Pidgeon (2003) and others (e.g. Giddens, 2009 and Jang and Hart, 2015) have outlined that issues associated with climate change and other environmental problems seem to take a low priority throughout the daily routines of most individuals. For example, the King Review (HM Treasury, 2007) which suggested there is a gap between an individual's understanding of climate change and their actions. This corroborates research by Bamberg and Schmidt (2003) that found car use is regulated by an individual's habit compared to conscious decision–making. Further barriers and obstacles are illustrated by Cass et al. (2005). They highlighted even if improvements towards alternative forms of

transport are achieved, the car will still be viewed as a status symbol and as a highly seductive tool. This was considered the result of adept market strategies from car manufacturers. This indicates that influencing travel attitudes is a difficult task for planners and policymakers.

In the main, research studies have paid little attention towards individuals who are heavily car dependent. Therefore new research is required that focuses on these groups to inform FTS (Bord et al., 2000; Barr et al., 2005; Tobler et al., 2012). Lorenzoni et al. (2007) identified willingness amongst individuals to be prepared to embrace, recycle or conserve energy in their homes, but they often resist changing their travel attitudes and behaviour. This has led some researchers to highlight the importance of new research to explore the disparity between the public recognition and concerns for environmental impacts and how to promote a behavioural change towards more sustainable travel, for example, 'value-action'; 'attitude-behaviour' or 'implementation' gaps (e.g. Blake, 1999; Kollmuss and Agyeman, 2002; Banister and Hickman, 2013).

Pooley et al. (2011b) and The National Institute for Health and Care (NICE) (2006) both suggest that a failure of previous transport strategies is that they have often been implemented or developed to promote alternative forms of transport but, at the same time, failed to understand the likely impacts on travel, thus potentially leading to unintentional effects and outcomes. Therefore this is a potential benefit of this research study as it is focused on community level.

An example of community transport strategies may include personalised School Travel Plans (STP), which became law in the UK and required every School to have one by 2010. A STP typically informs stakeholders (e.g. teachers, parents and pupils) of the most sustainable methods of travel to and from school. Initially, it was considered that such a transport strategy would be considered unpopular amongst these stakeholders, but there appeared to be strong support for such strategies, with many transport stakeholders (e.g. planners and policymakers) misjudging public support (Banister, 2008). This research study research concludes by suggesting misjudgement by transport stakeholders was likely to be because it is often considered implementing or developing sustainable strategies requires

fundamental changes to people's daily travel attitudes, which are often perceived as a negative impact upon individual's daily lives and routines. It is therefore unknown (for many) what makes people nervous and unwilling to change their travel attitudes or behaviour; hence, typically individuals are resistant to change. This begins to justify the importance of focusing this study on a mixed methods approach rather than a singular method approach, as some people might be initially or unintentionally less willing to share information related to their travel attitudes and behaviours. Albeit, by using multiple research methods approach for this research it aimed to capture a broad range of travel preferences. In turn, the intention was to gain a greater understating about how to influence the car use of individuals who are considered the most car dependent individuals along a selected travel corridor.

2.6 Demographic Influence towards Transport Strategies

There is still much debate concerning how to effectively implement and inform transport strategies in order to potentially promote a modal shift towards alternative forms of transport (discussed throughout this chapter). This has led to some research studies to contesting that the transport strategies lack direction (e.g. Lombardi et al., 2011). Evans et al.(2003:49) elaborate further by suggesting current transport strategies are merely:

> *"garnish sprinkled over pre-existing policy commitments, rather than involving a more fundamental rethink of policy approaches" (Evans et al., 2003:49).*

Marsden and Docherty (2013) advocate this has led to a greater emphasis (with particular reference to future UK transport planning strategies) to encourage a greater usage of alternative forms of transport through novel transport planning strategies. Ward (2003) indicated in order to achieve novel solutions, a key concept of sustainability is that it encourages greater participation and a fair distribution and accessibility of benefits must become universal (e.g. access to bus or train services). This advocates that the distribution of current transport services is uneven and unfairly distributed across different communities - providing further justification for investigating travel preference at the community level, as it is likely this research study will compare areas that have similar transport services.

Greed (2011) suggests future sustainable transport planning strategies must endeavour to consider the effectiveness and the importance of what may be perceived as insignificant details. Extensive research into the mobilities of transport (e.g. Hannam et al., 2006) and conceptualising future visions for transportation (e.g. Tight et al., 2011) has been researched and investigated.

Researchers have used many techniques in order to understand how to implement measure which might have the potential to reduce individuals' car usage. Different methodological examples include: Tight et al. (2011) who used futuristic images of conceptualised cities and towns to understand how different individuals would react towards different transport scenarios to understand their preference. Although a limitation of this approach is all the images were based on imaginary cities and towns therefore is questionable how likely it is that future spaces and place might look and interact as shown throughout the different scenarios. Gardner and Abraham (2007) used semi-structured interviews to explore potential reasons why individuals might drive to work and identified some key factors (time, easiness limited effort journey based affect, personal space and perceived cost). Jensen (1999) conducted thirty in-depth interviews to explore the difference in travel attitudes amongst individuals indicating such factors as: passionate drivers; the leisure driver and the daily routine of driving. It is broadly accepted that there is no preferred methodological approach to achieve this (Connell, 2008 and Yang and Zhang, 2008). The above review of literature further highlights there to be no singular transport strategy that could be implemented to change individuals' travel attitudes.

However, despite the extensive transport research, as outlined above, transport researchers suggest there is still limited transport knowledge and research regarding what triggers travel behaviour and how travel habits influence travel movement over different urban demographic characteristics (Chatterjee et al., 2013). As a consequence, the current research highlights that there is a need for further research to understand how to successfully inform new transport planning strategies by combining the views and opinions of different stakeholders, and in turn, promote low carbon travel options (i.e. decision makers and members of the public) (Banister and Hickman, 2013). It therefore seemed logical to focus this research on urban demographic characteristics and to investigate potential FTS with a range of stakeholders. It is worthwhile to note, Banister and Hickman's

(2013) reaserch focused on selected senarios. Therefore potential limitations of their work might include isolation or the excluding of certain transport senarios which might enable a reduction in car use. This identified gap in the research further justifies the importance of this work as there is need to further detremine how different demographic affect car usage in order to validate current research findings.

Despite a growing body of literature that highlights the potential dangers and acknowledges the consequences that may result from a high dependence on motor vehicles, behavioural change towards alternative forms of transport still faces continued constraints and resistance (Prillwitz and Barr, 2011). Research studies have called upon new research to encourage policymakers to pay greater attention towards personal land-based transport needs at a community level (Bristow et al., 2008). It is worthwhile noting that promoting alternative forms of transport does not go hand in hand with the complete eradication of the car, but trade-offs must occur that aim to find holistic solutions; thus more research and development is a prerequisite (Redman et al., 2013).

2.6.1 Indicators of Attitude and Behaviour Response

Several studies have attempted to investigate the relationships between attitude and behaviour. The term attitude has become extensively and broadly defined; for example, Hogg and Vaughan (2005:150) describe attitude as *'relatively enduring organisations of beliefs, feelings and behavioural tendencies towards socially significant objects, groups, events or symbols'*. Vogel and Wanke (2016) describe attitude as an object of thought. For the purpose of this research, an attitude is a set or structured way of thinking or feeling about something where behaviour is the way in which an individual may act or conduct his or herself, especially towards other people. Table 2.2 outlines key indicators that might be used to identify an individual's attitude.

Table 2.2 Examples of Key Indicators and Questions Associated with Attitude and Behaviour

Indicator of attitude	***Key questions***
Accessibility	How fast do you evaluate something and objects come into your mind?
Ambivalence	Are you someone who often has positive and negative thoughts?
Certainty	Do you hesitate when evaluating?
Issue-involvement	Is the topic important to you?
Knowledge base	Are your travel attitudes and behaviour influenced by knowledge?

Source: Adapted from Vogel and Wanke (2016)

The focus on individuals' attitudes and behaviours has intensified within recent years, with a specific focus on transport attitudes and behaviours (Davison et al., 2014). Individual's attitudes are typically outlined as the value-action or attitude-behaviour gap, whereby expressed pro-environmental attitudes or values are not reflected in the behaviours that individuals actually perform throughout their daily activities (Blake 1999, Barr and Gilg 2006 & Hares., et al 2010). In other words, an individual might say they or want to do something (e.g. walk or cycle to work) but in reality, their actions are very different, or are the opposite of which they expressed. The importance of focusing on transport attitudes and behaviours was further expressed by Howarth et al., (2009) who found that an individual's awareness and understanding of climate change is not typically reflected in their actions with specific reference to transport. They concluded that further research was required to identify measures that may support change (e.g. a reduction in car use) rather than simply providing information.

2.6.2 Interpreting Attitudinal and Behavioural Responses

A number of research frameworks have attempted to address and understand attitudes and behaviours. Two of the most commonly known examples include rational-actor models and moral/normative models (Kollmuss and Agyeman, 2002 and Steg and Vlek, 2009).

Rational-actor models focus on why an individual may make a certain choice and what information they might have used to in order to make a decision. For example, Steg

and Velk (2009) explored the different choices individuals make when considering money, time, effort and social status. One of the most widely used frameworks is the Theory of Planned Behaviour, proposed by Ajzen (2011). For example, it has been used to investigate the willingness an individual might have towards reducing their car use (Abrahamse et al., 2009 and Bamberg and Schmidt, 2003), predicting the usage of public transport (Heath, 2002) and environmental concerns (Groot et al., 2007).

Moral or normative models that investigate behavioural choices are typically used to investigate pro-social motivations for behavioural choices; for example, those choices that limit finite resources and emit harmful emissions. Steg and Vlek (2009) used this approach in an attempt to capture the influence that may underlie an individual's belief or attitude. One research model, which is widely known, is the Norm Activation Model (Schwartz, 1977) and it is widely used to explain altruistic and environmentally friendly behaviour (Onwezen et al., 2013). Norm Activation Theory proposes three factors: acceptance of particular personal values, beliefs that things important to those values are under threat, and beliefs that actions initiated by the individual can help alleviate the threat and restore the values. A further modelling approach derived from this model approach is Value-Beliefs-Norms theory proposed by (Stern et al., 1999). Figure 2.4 outlines the theoretical concepts that are applied to Value-Belief-Norm theory.

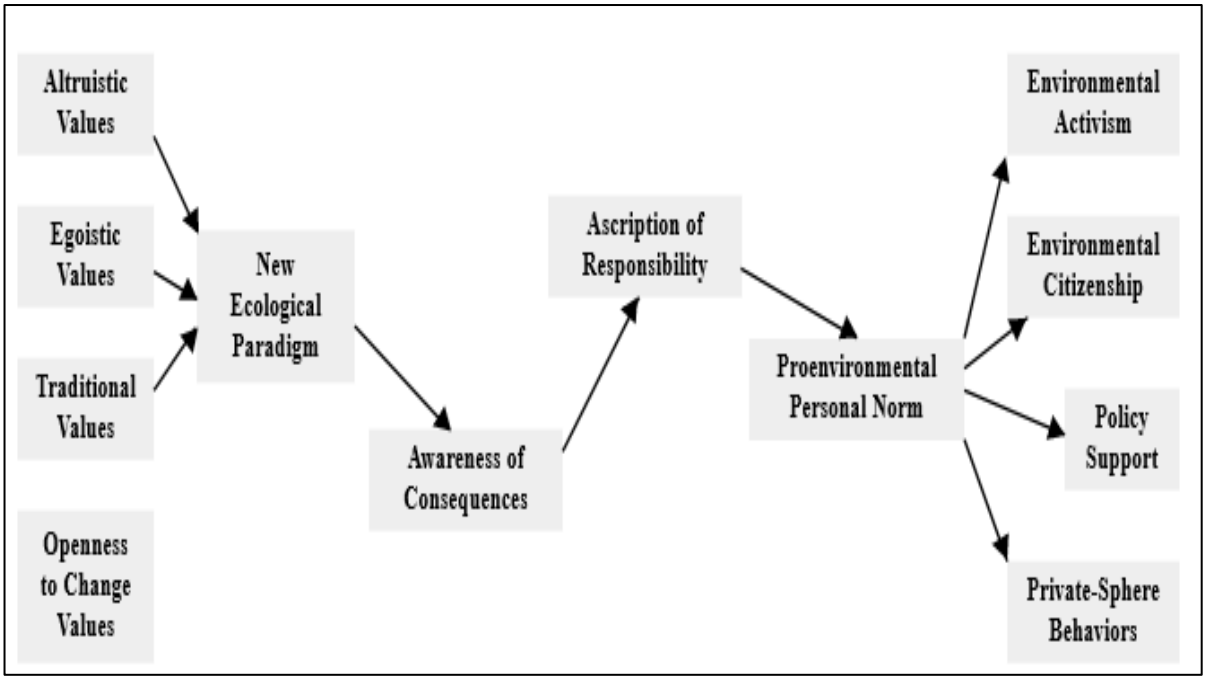

Figure 2.4: Theoretical framework of Value-Belief-Norm Theory

Source: Stern (1999)

A number of researchers have sought to develop models of behaviour to examine environmental behaviour by combining moral or normative influences identified by the Norm-Activation Model or Values-Beliefs-Norms, and the more rationalist approach of the Theory of Planned Behaviour. A limitation of this approach has been outlined by Steg and Vlek (2009) who suggested a limited emphasis has been placed on investigating the contextual factors; for example, both societal influences (e.g. age, gender and wealth) or situational influences (e.g. access to public transport) that might influence an individual's choice.

Barr and Gilg (2007) and Barr et al., (2001) present alternative theories by combining a range of theories to understand influences relating to behaviour and attitude. They combined situational variables, psychological variables, and social and environmental values and determined each will have an effect on an individual's intention relating to their attitudes and behaviour. This approach therefore allowed a mixed methods approach to be used as it engaged elements which were familiar with Theory of Planned Behaviour and Values-Beliefs-Norms. The next section of this chapter outlines how travel attitudes and behaviours have been influenced through different transport measures.

2.6.3 Travel Attitudes and Behaviour through Travel Measures

A review of research studies appeared to indicate different transport measures that have been considered as the most influential in order to promote and encourage a change in travel attitudes and behaviour towards a reduction in car use. The below measures have been grouped into two main transport strategies or packages, they are: soft and hard strategies– as defined earlier in section 2.3. It therefore seemed logical, to split the eighteen FTS (refer to Chapter 3 and section three of the questionnaire) across the five identified areas. Each area is outlined and discussed in turn below.

2.6.3.1 Hard Transport Measures

Road Charging (e.g. congestion charge or increased taxation) is considered by many as one of the best known and well research strategies. The theoretical benefits and the discussion regarding the implementation of road charging have been widely reported (Kilani et al., 2014; Percoco, 2014; Francke and Kaniok, 2013). Daniel and Bekka (2000) reported that vehicle emissions (NO_X, CO and HC) within congested areas could be reduced by 30% if road charging was introduced. London (2003), Stockholm (2006), Durham (2002), Milano (2008), Rome (2001) and Valletta (2007) provide examples of areas that have implemented road charging with the intention to combat road congestion or environmental impacts. With the Netherlands, Copenhagen, Budapest, New York, Birmingham and Manchester being examples of cities that have considered or currently considering introducing congestion charges. However, Kim et al. (2013) highlight that it is unclear how different groups of individuals respond to road charging, and whether their perception of benefits is different. Further studies by Bonsall and Kelly (2005) investigated the likely impacts of road charging, if introduced in Leeds, amongst groups of individuals at-risk (i.e. low income, disability, age, gender, membership of a social minority). They found that low income and disabled groups would be the most affected by road charging as there were limited transport alternatives and it would therefore affect the most vulnerable members within society if such strategies were implemented.

However, hard transport strategies are not purely related to charging road users an additional tax. For example, these strategies can influence urban design, such as segregated cycle and bus lanes. It is widely acknowledged that a deterrent for using alternative forms of transport is the level of danger that is often associated with these forms of transport

(Wardman et al., 1997; Tilahun et al., 2007; Gatersleben and Appleton, 2007; Guell et al., 2013). Extensive research has shown that demographic characteristics, such as gender or ethnicity, have a strong influence on travel attitudes and behaviour when individuals consider alternative transport use. Wardman et al. (2007) found males were more likely to cycle than females, they were more likely to walk or use the train user, and less likely to be a car passenger. This concurs well with other studies that in addition, suggest cycling is concentrated and more likely to be undertaken by white able-bodies males and the young (Steinbach et al., 2011; SportsEngland, 2014).

2.6.3.2 Soft Transport Measures

In addition to the physical strategies as discussed above, transport planners and policymakers may attempt to encourage change rather than attempt to engineer change. Employment incentives, for example changing facilities (i.e. safe lockable storage, shower and washroom facilities) are considered to significantly influence travel habit and behaviour. Gatersleben and Appleton (2007) studied the travel attitudes of individuals in the South East of the UK. Their findings indicated that cyclists' requirements are undervalued and they outlined the influence of societal changes to provide adequate changing facilities within a professional environment. The importance of changing facilities concurs well with other research. For example, Uttley and Lovelace (2016) explored promoting long term behavioural change to favour cycling based upon a case study in Sheffield. In addition, Damant-Sirois & El-Geneidy (2015) explored a segmentation approach to understand the likely justifications for different people to cycle in Montreal.

The cost of travel is also recognised to have a significant influence on travel preference and has been used in both hard and soft strategies. Cost has long been perceived as a key element in order to promote modal change in favour of reducing car use towards alternative forms of transport. Mason (2000) investigated the influence of travel attitudes of business travellers on low cost airlines. He found price was the most important factor, then in-flight comfort, followed by flight frequency. This links well to travel incentives, for example, customer-loyalty Schemes, Cycle2Work schemes, or discounted tickets to local and national attractions. Fishman et al. (2012) sought to investigate barriers and facilitators to cycling in Brisbane and Melbourne, Australia. Their research was based on focus groups split between three categories (regular cyclists and non-regular cyclists). The results found

that many of the participants across all three distinct sample groups were in favour of being paid to cycle. This might indicate a greater level of investment and funding is required to effectively promote and encourage alternative forms of transport. Although transport policies in the UK appear to favour the car, (as discussed above), for example, the recent freeze on fuel duty, for the fourth year, it may be a utopian vision and unrealistic to expect greater levels of funding for alternative methods of transport.

The research studies outlined above indicate the potential influence demographic characteristics have towards influencing car use attitudes and behaviour. Therefore, this study specifically focused on them in order to investigate the effect they had on groups of individuals who were highly car dependent. However, as outlined in this chapter and Chapter 1, there appears to be limited research that investigates individuals who are highly car dependent. Therefore, in order to make a real difference towards transport habits and attitudes, we need to look further towards the groups of individuals who are most reliant on their cars. Research studies have focused on individuals who have shown willingness to reduce their car use. Overall, there seems to be a need for new research to inform transport stakeholders about how to reduce the car use of different groups of individuals who have been identified as highly car dependent. In addition, there seems to be no preferred research method to investigate travel attitudes and behaviour. This provided further justification to use a mixed methods approach for this research study to ensure a robust methodology and to gain detailed insights into travel attitudes and behaviours.

2.6.3.2 Personalised Travel Management

In addition to the above, personalised travel plans are particularly prominent in order to reduce car use. A broad range of research studies has attempted to capture the benefits and future knowledge gaps of personalised travel strategies (i.e. Travel Demand Management). Travel Demand Management (TDM) is a strategy to reduce demand for single occupancy vehicle use typically along regional transportation network. As a regional strategy to improve transportation system performance, TDM can: reduce highway congestion; improve air quality; accessibility to employment, schools, and provide other opportunities, for example, improve quality of life and wellbeing.

Despite this, there remains uncertainty about how to implement transport strategies. Goodwin & Van Dender (2013) found that there is doubt about how younger people will travel as they age, or how the next generation will travel. However this research is concentrated around understand the travel attitudes and behaviours of typical peak (e.g. 8-9am) car trips. This further provides justification for this work as it is not fixed to one singular time period. Furthermore, there is a current level of uncertainty about future car use. Researchers (e.g. Sammer, 2016 and Maes et al. 2013) argue that rather than developing policies based on forecasts, we should be developing policies for a range of plausible scenarios. Their work concurred well with Cairns et al., (2008) who found there to be growing interest in a range of transport policy initiatives which are designed to influence people's travel behaviour away from single-occupancy car use and towards more benign and efficient options, through a combination of marketing, information, incentives and tailored new services. They conclude by suggesting some measures could play a very significant role in addressing traffic, given the right support and policy context, and if the right strategies were implemented which met individuals specific travel demands. This indicates that the right transport strategies have not yet been implemented or effectively employed by transport researchers and new research is required. Finally, Gärling, and Geertje (2007) suggested that in order to reduce travel demand non-coercive TDM measurements may provide an attractive solution to communicate the benefits of reduced car use amongst the public. However, coercive TDM measurements are likely to become more effective, acceptable and politically feasible.

2.6.4 Future Transport Requirements

Pooley et al. (2011a) argue the need to investigate wider societal changes across different groups of individuals in order to tackle strong car-use habits. Transport researchers argue it is critical for new research to develop an understanding of travel attitudes and behaviours across different demographic groups (Anable, 2005; Jensen, 1999; Steg and Vlek, 2009). Redman et al. (2013) argue future research must pay greater attention towards transport strategies that are targeted to different demographic characteristics to encourage a greater use of alternative forms of transport. This concurred well with Haustein and Hunecke (2013). They concluded that future transport planning strategies must strive to engage with a broad range of socio-demographic groups considering different types of

location and those who hold different travel attitudes to encourage a new nuance in academic research concerning transport strategies. Chatterjee et al. (2013) further highlight there to be limited research into understanding circumstances and motivations which might encourage individuals to use alternative forms of transport. This is complimented by Schwanen et al. (2012) who argue the need for a new research angle to focus upon the travel habits that may be embedded as a result of gender, class, or age, all of which seem to be major influencing factors on an individual's car use. It therefore seemed further justified to focus this study upon the three demographic characteristics as mentioned above. Pooley et al. (2011b) also confirmed the importance of focusing upon people by suggesting previous research has focused too heavily upon travel factors such as the journey, urban realm, efficiency often ignoring personal and household travel factors.

2.7 Interpreting Travel Attitude and Behaviour Theory

The following sections provide an overview of some of the theoretical frameworks that exist within transport research literature and have become engrained and developed to interpret travel attitude and behaviour.

2.7.1 Consumer Choice Theory

Consumer Theory is concerned with how a rational or everyday consumer would make consumption decisions. Consumer Choice Theory has been widely used to interpret and derive economic and environmental attitudes and behaviours (Gowdy and Mayumi, 2001; Hands, 2010 & Foxall, 2016). Typically, the Theory of Consumer Choice is interpreted by a consumer's income or wealth (Levin and Milgrom, 2004). Therefore, Consumer Theory is based around the problem of different hypotheses concerned with the nature of consumer demand. Although a limitation of this approach is the assumption that all consumers fully understand their own preferences and that they are rational. Furthermore, some behavioural studies, which have become well established, have shown other factors contribute towards individuals behavioural attitudes, such as if choices are presented as packages or separately, or the influence of brand loyalty (Kotler, 1984; Morrison, 1986; Dick and Basu, 1994; Obermiller, 2015 & Zeng et al. 2015). This is worthwhile to recognise for the purpose of this research, as some road users might have brand loyalty to the car and in turn, have loyalty to using the car over other forms of transportation. This is further prevalent as this study focused on individuals who were considered to be the most car dependent from

the sampled population. Furthermore, the way in which the data is presented to participants (e.g. either as packages or single strategies) could have an influence on the findings of this research study as the participants might have a preconceived stigma attached to one package over another.

2.7.2 Time Travel Perception

The perception of travel time has been extensively researched (Mokhtarian & Salomon, 2001; Tranter, 2004 and Wallis, 2004). There are several measures, which have been identified to understand the perception of travel time, which have been summarised in Table 2.3. This table is only a guidance as different perspectives are likely to exist which might create different opinions, valuations and outcomes. It is broadly accepted that the perception of time will depend heavily on the type of a trip, travel conditions and traveller preferences an individual will undertake (Small et al., 2005). For example, being able to sit comfortably, relax and have the choice of where to sit tend to create a different perception from a bus, which is crowded.

Furthermore, it is broadly acknowledged that the choice of travel will vary from person to person. Börjesson and Eliasson (2012) surveyed cyclists in Stockholm to understand what they valued the most from their travel time. They found that most cyclists seem to consider factors associated with their health when making their travel choices. This contrasted with Dell'Olio et al. (2011) who surveyed public transport users and found that waiting time, cleanliness and comfort were all important aspects when considering their desired travel opinions. This highlights how different travel users might have different travel preferences.

Table 2.3: Transport Time Valuation Perspectives

Time/Cost	Description	Implications
Travel Time	Time devoted to travel	Subjectively defined
Clock Time	Measured objectively throughout a journey	Typically that most people will define travel time as this
Perceived Time	The time each traveller perceives their journey to take	Reflection of travellers comfort
Paid Time	Travelling for work or business	Typically high hourly costs
Personal Time	Part of your daily route (e.g. daily commute)	Mostly reviewed in economic studies
Generalised Cost	Travel time combined with financial costs	Typically used in traffic models
Effective Speed	The total time devoted to travel; i.e. the cost of travel compared to earnings.	Modes of transport will vary on cost dependent

Source: Adapted from Victoria Transport Policy Institute (2017)

Additional factors which have been broadly accepted and extensively researched are the implications associated with demographic characteristics, or the effects urban structure can have on manipulating travel time, which were outlined above in this chapter. Stone and McBeath (2010) found that male and female estimations for a trip were significantly different when exposed to multiple routes, and Lee (1970) found that individuals perceived concept of distance was different and depended on how far or near they live to the city centre. This is an important consideration for the purpose of this research study, as an intention of the study is to investigate travel habits and attitudes along an urban travel corridor. Therefore, data will be based on participants who live at different intervals from the city centre and both male and female travel opinions will be gathered. It is therefore logical to have an awareness of some of the factors that might influence and justify the participants' responses, with the view to minimise these limitations from entering the data.

2.7.3 Cognitive Dissonance Theory

Cognitive Theory, proposed by Festinger (1957), indicates that each individual has an inner drive to hold all of his or her attitudes and beliefs in harmony with the intention to avoid disharmony (or dissonance). It is recognised that attitudes can change because of

factors within a person's past and experiences. Festinger (1957) established this theory by observing participants who predicted that a natural disaster would destroy the world. Festinger (1957) observed that some participants felt they needed to learn from their previous misjudgement, which contrasted to other participants who attempted to justify further and prove they were correct. This concurs well with Chen (2014) who studied the influence of age and cohort effects to individuals' travel preferences, finding that an individual's change is linked to the person's perceived past.

Cognitive Dissonance Theory understands that individuals broadly seek consistency among their cognitions; for example, their beliefs, preferences and opinions. It is where there is a difference or discrepancy between individual's attitudes and behaviour (dissonance) it is perceived something must change to eliminate the dissonance. A review of theoretical literature indicates that dissonance can be described by three separate characteristics. Individuals can change one or more of their attitudes, and methods to reduce dissonance can be acquired by gaining new information which outweighs previous beliefs, and when dissonance is reduced in turn, this reduces the importance of the cognitions. It is important to recognise the significance of this theory to this research study. As some participants may perceive some forms of travel as more dangerous, confrontational than others and thus have a preference towards a specific mode of transport.

In addition to the theoretical concepts outlined above, some further theoretical methods include Cumulative Prospect Theory (CPT), which provides a well-supported paradigm for choices made under uncertainty (Connors and Sumalee 2009). Forced Compliance Behaviour Theory is when someone is forced, for example, by peer pressure to do something they do not want to do. This relates well to theories associated with social norms (Wicker, 1986 and Ehrlich, 1969) and Reasoned Behaviour (Ajzen and Fishbein, 1980) which postulates subjective norms. For example, a young adult or teenager might desire a particular fashion boutique, to watch a movie, or travel by a certain means of transport. However, their parents/guardians might not approve or their peers might perceive it not to be the trendy ''*thing*'' to do. This was further confirmed by Trapp et al. (2011) who found that cycling can be perceived as *"cool"* in one neighbourhood and not in another, whereas Xing et al. (2010) found it was perceived as normal. On the other hand, Emond and Handy (2012) found that driving was the coolest way to travel amongst the neighbourhoods they

surveyed. Today, it is broadly accepted that concerns about appearance and the traveling preference of companions have a negative effect on the decision-making of adult travellers (Bopp et al. 2012).

It is was considered critical to have awareness of some transport theories and methods as they all have a potential influence on the outcome and findings of this research study. This in turn, allowed this research study to attempt to limit some of the limitations noted above.

2.8 Chapter Conclusion

A review of current transport literature has shown there to be an extensive body of research associated with travel habits and attitudes which has attempted to encourage a reduction in car use, both in the UK and further afield. Despite this, the car remains the preferred method of transport for most individuals. Transport stakeholders, such as planners, activators and policymakers are finding it problematic to introduce effective strategies and measures that will reduce individuals' car use. This chapter has revealed there to be a current void and absence in research that informs and supports a change to successfully implement transport strategies, which will encourage or engineer a change in travel habits and attitudes away from focusing on the car. The attempt to understand how people might or could travel has become an integral part of global, national and local policies, with the demand to reduce environmental and wider socio-economic impacts of transport ever persistent and in vogue.

Despite recognition of the potential environmental consequence of increased car use, this chapter has discovered new research is required that goes beyond the current tokenistic approach in understanding travel habits and attitudes. Transport strategies have been implemented to reduce car use but have been found to make little or no impact. However, this chapter has shown contradicting rhetoric by some travel stakeholders, for example, policymakers, as they suggest they want to reduce car use but often promote and invest in road building projects.

A key finding of this chapter is that there is a lack of knowledge associated with travel habits and attitudes of those individuals who have a strong affiliation towards the car, particularly at a community level. Further research is also required to understand the

influence demographic characteristics have on travel habits and attitudes and how all of this will affect future travel demands. A review of the current literature indicates that current transport research studies have typically focused on national strategies or have aimed to determine the effectiveness that future technology might have on transport habits and attitudes. In turn, transport researchers have typically ignored and failed to address research areas associated with individuals who are highly car dependent. This therefore presents a useful avenue for further research.

A broad range of transport theories have been outlined which have been used to predict and determine transport habits and attitude. However, for the purpose of this study it was considered logical to focus on a broad range of research methods. As this study intends to combine the views of a wide range of stakeholders, the use of one method alone was considered inadequate to investigate a varied number of stakeholders. In addition, this chapter presented potential limitations with how participants might intentionally or unintentionally mislead the researcher, and how they might have preconceived narratives towards certain transport measures. This presents a further key finding of this chapter, as an awareness was gained to how some individuals might attempt to influence this empirical research study by pleasing the researcher.

It is therefore the intentions of the proceeding chapter; Chapter 3, to discuss how the methods of this research study will address the key research gaps and avenues that have been identified in this chapter, investigating the benefits and limitations of each method in turn.

Chapter 3

Chapter 3: Methodology of the Research Study

3.1 Introduction

It is anticipated that a significant amount of data will be required to address the aims and objectives of this research. This chapter describes the methods used to gather the data, detailing how they are linked, and how they individually seek to contribute to address the overarching research aim and objectives. It is the purpose of each research stage to have the ability to impact on the research findings. Therefore limiting data error (e.g. through data collection or design) was paramount throughout this research study in order to strengthen the overall research findings.

This research utilised a mixed methods approach to engage with transport stakeholders in order to achieve **OBJECTIVES 1 - 3**. In total, three individual research methods contributed to this research study: questionnaires, travel diaries and interviews. Figure 3.1 presents these methods within the overall approach adopted for the research. Figure 3.2 outlines a brief overview of each individual research method and presents their individual contribution to this research study.

The data was collected to explore the effect that demographic characteristics have on travel attitudes and behaviour of the sampled participants who were highly dependent upon their car travel **(OBJECTIVE 1).** It was the intention that the findings of this research could be used to inform transport stakeholders (e.g. planners, policymakers and car users) on how to encourage a reduction in car use and promote low carbon travel. Each stage of the research, consisting of a research method was conducted in a sequential order as each method informed the next stage. For example, the interviews could not take place until the questionnaires and travel diaries were complete; further justifications are detailed throughout this chapter. Figure 3.3 shows the four significant stages of this research study (shown in blue). The dashed red lines indicate a change in the research stage, whereas the purple outline indicates the overall research justification.

The previous chapter, Chapter 2 highlighted some potential avenues for further research in the field of transportation. The chapter concluded by recommending a mixed methods approach was the most logical approach in order to capture a broad range of

travel opinions. To address the main findings of the previous chapter, the main intentions of this chapter are to:

1. Develop a methodology to engage with a broad and diverse range of transport stakeholders, for example, car users, planners and policymakers, achieving **OBJECTIVES 1 & 2**.
2. Develop a method focused towards a local transport community to evaluate how transport strategies might influence the travel attitudes and behaviours of individuals who have a strong association towards the car, achieving **OBJECTIVE 1**.
3. Provide recommendations for transport planners and policymakers of potential strategies, with the view to promote a reduction in car use and enhance low carbon travel amongst a specific group of car users, achieving **OBJECTIVES 3, 4 & 5**.

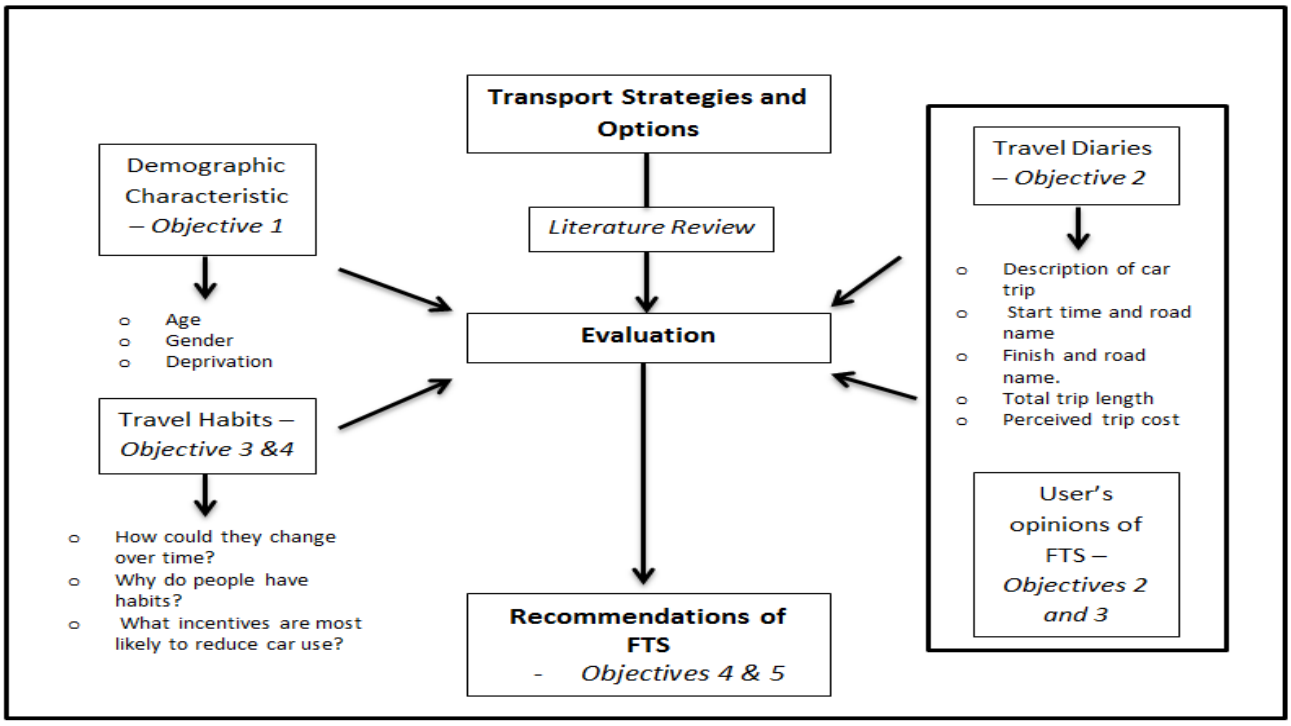

Figure 3.1: Research Approach

Figure 3.1 outlines the theoretical framework that underpins this research study. Initially, different transport strategies were identified that might influence an individual's car use based on the findings of Chapter 2. The intention of the questionnaire was to evaluate travel preferences of different people, for example, how different demographic characteristics might influence car use in order to achieve **OBJECTIVE 1.** Furthermore, it was considered this approach would be most applicable to gain the views and opinions of a

number of transport stakeholders (e.g. members of the public) over a relatively short period. The next stage then used travel diaries and interviews to engage further with a specific group of road users, focusing on those individuals who had indicated they were most dependent on their car for their daily travel. The methods explored travel patterns and how the preferred FTS and incentives (from the questionnaire) would influence the selected participants' travel attitudes and behaviours, achieving **OBJECTIVES 2, 3 & 4.** This allowed a detailed discussion to unfold and in turn, a serious of recommendations emerged to inform new transport strategies. This informed transport stakeholders (e.g. planners and policymakers) of the mostly likely FTS to reduce the car use of a specific group of road users in favour of alternative forms of transport, achieving **OBJECTIVE 5.** The data obtained for the purpose of this research addressed fundamental aspects of travel attitudes and behaviour through a coarse data approach.

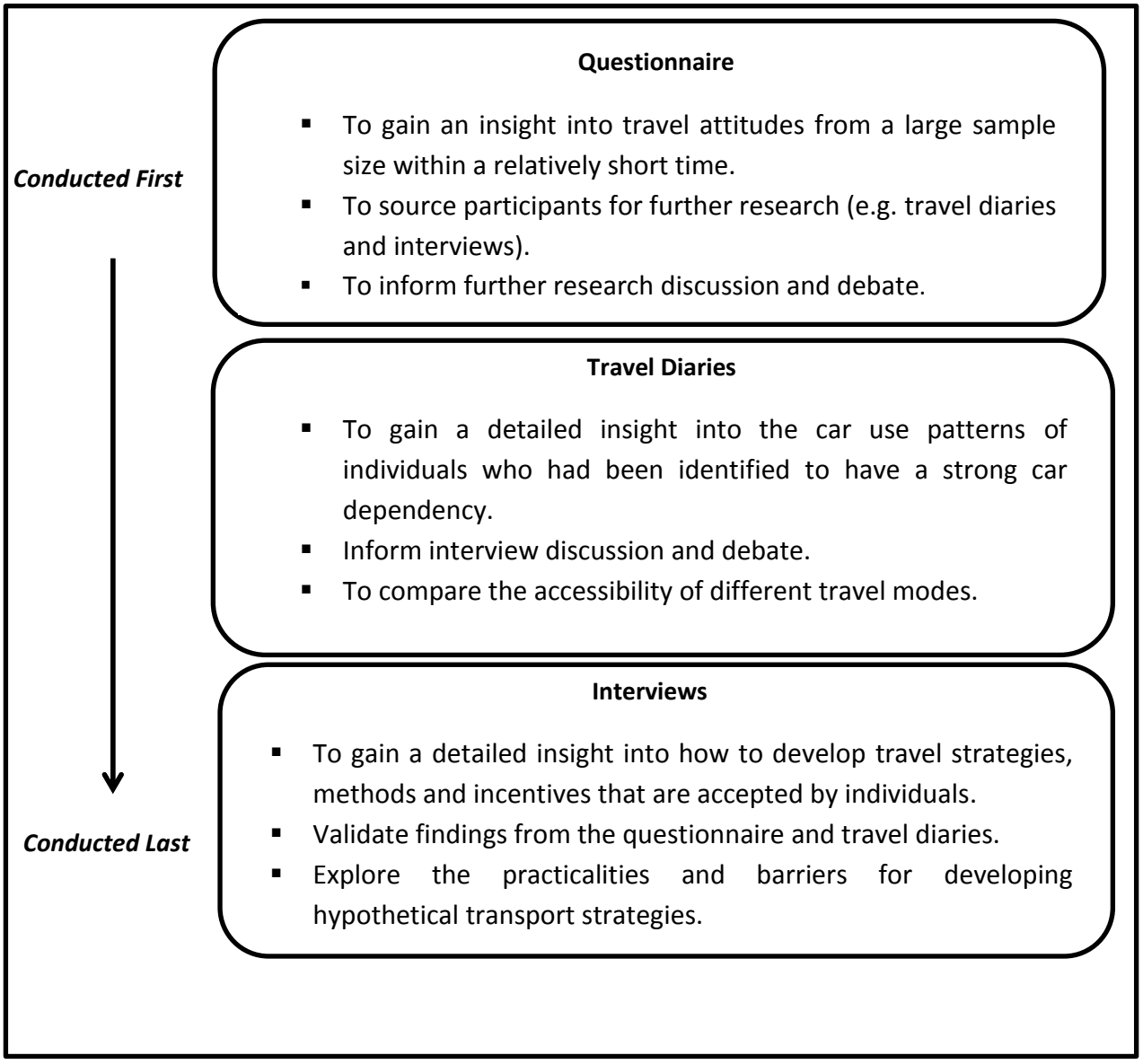

Figure 3.2: Principle Intentions of each Research Method

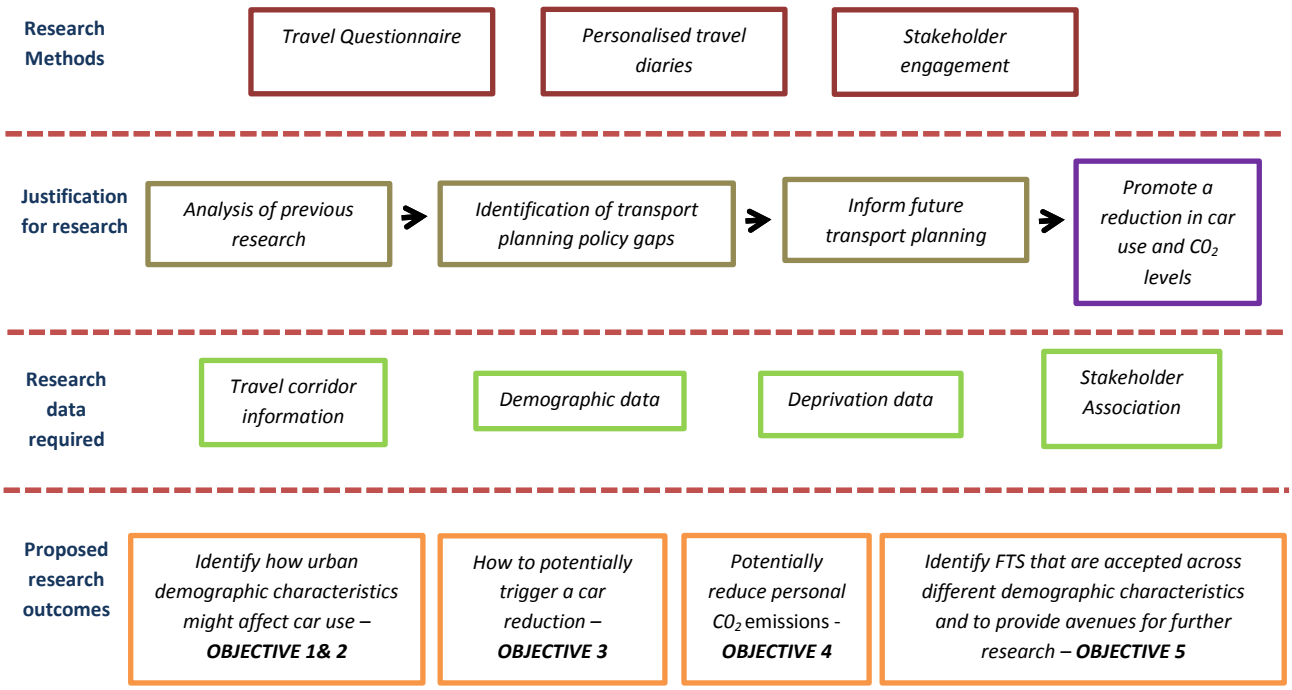

Figure 3.3: A Breakdown of each Research Stage

Based on Chapter 2 and Figures 3.1 and 3.2, three broad research key questions unfolded. They were:

1. Urban demographics impact car use. The method should provide the opportunity to investigate how demographics characteristics affect car use in order to inform future transport measures and strategies.

2. Typically, previous transport research studies have focused on groups, households or individuals who are most willing to reduce their car use. In light of this, limited research is known how transport strategies might be implemented to reduce the car use of individuals who are most car dependent across a specific transport corridor.

3. Future travel attitudes and behaviours are unknown. The method should allow this work to inform and provide an insight for transport stakeholders (e.g. planners and policymakers) in terms of future travel needs and demands.

3.2 Introduction to Research Methods

The intention of the next section of this chapter is to provide a broad overview of the potential theoretical methods that could have been implemented and those that were employed for the purpose of this research study.

3.2.1 Questionnaire Methods

Questionnaires are widely used across a broad range of research studies, from transport, health, to understanding household preferences (Anable, 2005; Cole, 2005 and Yüksel, 2017). A variety of questionnaire methods have been used and they have varying degrees of success, and all have benefits and limitations associated with them. Methods associated to questionnaires may include image registration, revealed preference or stated theory.

Image registration has been widely used to conduct questionnaires (Rosen et al., 1996; Ekman et al., 2015 & Pierre et al., 2015). Zitova and Flusser (2003) described this process as using two or more images of the same scene, but taken at different times, viewpoints and/or by different sensors and overlaying the images in order to gain feedback from a selected group of participants. However, this method was not considered practical for the purpose of this research study. It was deemed it would be too time consuming for respondents to complete when completing a questionnaire (which was designed to gain responses on travel preferences in a relatively short time period), and could potentially confuse participants if they were unfamiliar with the concepts of the research study. Albeit, an adaptation of this process was considered worthwhile throughout the interview discussions as there would be a greater opportunity to have a detailed discussion with respondents regarding how FTS may affect their travel attitudes and behaviours. In addition, by showing futuristic images of how sustainable transport may look and interact, this might help participants visualise future transport infrastructure and enable a discussion to unfold concerning aspects they preferred or disliked the most. A further detailed discussion can be found in Section 3.8.

Revealed preference, a method pioneered by Paul Samuelson in 1948, is a method that analyses choices made by individuals, mostly used for comparing the influence of policies on individual's behaviour (Carson & Plott, 2014; Charness et al., 2013; Wong, 2006

and Samuelson, 1948). Researchers have used this theory for a variety of reasons, although it has been used extensively to determine if respondents are attempting to please the researcher. For example, Hall et al. (2012) used 'magic' to expose respondents. They found that many role reversals remained undetected and participants would often attempt to construct coherent and unequivocal arguments supporting the opposite to their original viewpoint. This further justifies the importance of conducting a research study based on a mixed methods approach, as detailed discussions and analysis of participants responses were explored across a wide range of research methods, which allowed the data (if needed) to be validated.

Stated preference was original developed for marketing in the early 1970s. Kroes and Sheldon (1988) described stated preference as a family a techniques that explore with individual respondents' about their preferences towards a set of transport options to estimate utility functions. Typically, the options are descriptions of transport situations or contexts, which have been constructed by the researcher. By their very nature, stated preferences typically require purpose-designed surveys for their data collection. A wide variety of stated preferences have been researched and can include: conjoint analysis, functional measurements, trade-off analysis and transfer price method. Stated preference responses have been widely used in transport research, and extensively throughout other research disciplines (e.g. health and environmental amenities) to understand how individuals' habits and attitudes might be influenced (e.g. Tilahun et al., 2007; Aldred 2017 and Campbell et al. 2014). However, Fujii and Gärling (2003) suggested a potential limitation of stated preference. They suggest stated preference responses are contingent on the context of the surveys. Aspects of this study adapted a similar approach, for example, by asking participants to indicate how their car use might be influenced by eighteen FTS (refer further to section 3.6).

Alternatively, some researchers group travel packages or strategies together in order to understand the influence they might have on travel habits (e.g. Lang and O'leary, 1997 & Walker and Jieping, 2007). However, it was not considered worthwhile grouping transport packages (e.g. road charging or urban design) as respondents might have pre-conceived narratives about different transport strategies and therefore, this research study did not want to unintentionally manipulate the findings, which was a key finding of Chapter 2.

However, if participants wished to provide additional strategies (that they perceived to not be detailed in the questionnaire), additional space was provided at the end of each questionnaire to allow participants the opportunity to provide further information; this justifies the significance of taking this approach.

3.2.2 Travel Diary Methods

All participants who completed a personalised travel diary were required to take part in an interview. As outlined above and throughout the previous chapter, a limitation identified with self-reporting is that some participants might attempt to mislead the researcher. Therefore, the information provided in the travel diaries would require verification, which was achieved by desktop analysis using mapping software such as map my ride and google maps). Travel diaries have long been acknowledged as a useful and popular method to gain an insight into individual's daily travel use. Stopher (1992) argued that travel diaries are a popular method to gain an insight into forecasting travel attitudes and behaviour and aid the decision making of new strategies. Although there is no predetermined set length to a travel diary, as researchers have conducted travel diaries over a number of different time periods, for example, weeks or days (e.g. Axhausen et al., 2002; Garvill et al., 2003 & Molin et al., 2016).

Furthermore, Stopher (1992) emphasised the importance of determining the meaning of a trip when researching travel attitudes and behaviour. Stopher argues that often unimportant trips, for example, a trip to the newsagents, are typically forgotten or not recorded, and studies should define and give a concise meaning of the term trip to each participant. Therefore, at the start of each travel diary, the meaning of trip was defined for the purpose of this research study and participants were provided with a working example. This was essential to this research study for two reasons: firstly, the research study wanted to capture all the trips made by a participant; and secondly, all participants were given the same definition of the term trip and therefore, it is reasonable to assume that the likelihood a participant misinterpreting the term trip was reduced.

There are two broad methods that are typically used in studies associated with travel diaries, which are travel and active diaries (Panter and Jones, 2008; Ogilvie et al., 2008 & Kelly et al., 2011). Both research methods are similar and widely used, although Table 3.1

outlines some of the subtle differences in their approach. The most significant differences are related to how participants might respond to the start and finish of their journey.

This study was not interested in the detail of an activity an individual might undertake, for example, the type of shopping an individual might do (e.g. grocery or clothes). All participants were asked to state the purpose of their trip, for example, for shopping or taking the children to school. They were not required to indicate the start and finish time of an activity, for example, the time it took to do their shopping at the supermarket, as this had no relevance to their travel habits. As the main purpose of this research was to address how strategies could be introduced to reduce car use and not the activity an individual might or might not participate in. Therefore, it was considered reasonable to conduct personalised travel diaries for the purpose of this work and not active travel diaries.

Table 3.1: Comparison between Travel and Active Travel Diaries

Travel diary	**Active Travel diary**
Where did you go?	What did you do?
What was the purpose?	When did you start?
When did you leave?	When did you finish?
When did you arrive?	What did you do it for?
How did you get there?	How did you get there?

(Source: Adapted from Stopher, 1992)

3.3.3 Interview Methods

All interviews intended to explore the proposed travel strategies that were shown to have the greatest effect on reducing an individual's car use based on the questionnaire and to gain a detailed insight into individual travel preferences. It was the intention this would allow this study to determine how travel attitudes and behaviour might be influenced across different urban demographics, achieving **OBJECTIVE 1**. It was recognised that each interview needed to be tailored to each participant in order to reflect their specific travel attitude and behaviour.

Many studies have used interview techniques to attempt to understand travel attitudes and behaviour (e.g. Juvan, E., & Dolnicar, S., 2014; Valkila, N. & Saari, A. 2013 &

Paulssen et al., 2014). As outline above, the use of imagery was considered worthwhile and a useful tool at this stage of the research study, as a detailed discussion between the researcher and participant could take place.

It was the intention of this study to gain a broad range of travel opinions in order to allow this work to gain a wide variety of opinions relating to FTS. Therefore methods which did not allow for a broad range of dialog and discussion between the interviewer and interviewee to take place were omitted from this research study. It was the intention this would enable this study to gain a wider variety of opinions regarding travel attitudes and behaviours to be achieved and in turn, achieved **OBJECTIVES 2 & 3**.

In light of the above, decision rules where a structured interview approach is typically used and where the researcher follows a predetermined structure were not considered practical methods for this research study. It was recognised that each interviewee might bring their own interpretation of a strategy and therefore a specific set of questions would potentially not be applicable or appropriate. This in turn, allowed this research to achieve and address its objectives, as outlined in Chapter 1.

The above section has highlighted some potential avenues of theoretical methods that could have been implemented for the development of this research study. However, as discussed above, some research methods were excluded from this study, as they were considered to have little or no benefit. In addition, it was recognised that alternative research methods could have been deployed in this research study, for example, focus or internet forum groups. However, it was considered more useful to detail some of the theoretical methods which related directly to the methods used in this study. The disbenefits and benefits of alternative research methods such as focus groups are discussed later in further detail throughout this chapter.

In the main, this research study was based on a qualitative approach with a quantitative method being used as a starting point to gain an initial insight into travel preference and participants for further research. Clifton and Handy (2003) justify the importance of taking this approach. They indicate that without more widespread use of qualitative techniques for travel behaviour by researchers, policymakers and planners will struggle to make any meaningful progress towards improving our fundamental

understanding of travel behaviour and attitude. Therefore, it is the intention of this research to provide detailed insights into travel attitudes and behaviour at a community level amongst people who are highly car dependent.

The next sections of this chapter provide an overview and justification of conducting a mixed methods research study. The order to which each method is discussed reflects the order of which they were conducted throughout this study.

3.4 Introduction to a Mixed Methods

An overarching aim of social science is to make sense of, or to understand, complex human behaviour and experiences in order to inform future research or strategies (Tashakkori and Teddlie, 2010). It was therefore deemed to be most practical to construct this research study on a range of methods that allowed the overall study to broaden its potential scope, dimension and stakeholder engagement. It was the intention this would allow the research to gain a fuller picture concerning individuals travel attitudes and behaviour. As mentioned, travel behaviour is highly complex. Therefore research studies often benefit from developing methods that seek to gain a deep and broad understanding into individuals travel attitudes (Beirão and Sarsfield Cabral, 2007). It was therefore considered logical to develop a mixed methods approach for the purpose of this research study (refer to Chapter 2).

Mixed methods aim to combine quantitative and qualitative research strategies for the sole purpose of a singular research study (Johnson et al., 2007). It is accepted that all research methods, regardless of stature, will have benefits and limitations. It was therefore considered sensible to investigate the hypothetical limitations and benefits that were associated with a mixed methods study. The intention was to minimise the limitations and exploit the benefits. Table 3.2 provides a summary of the benefits and limitations of a mixed methods approach as suggested by Driscoll et al., 2007. It was considered critical to be aware of some of the limitations of a mixed methods approach as they might underpin some of the limitations of this work.

Consideration was given to alternative research methods that could have been used throughout this research study. For example, Guiver (2007) used focus groups to understand travel attitudes. However, focus groups were considered too time consuming

and problematic to find a singular time that would be convenient for all participants to participate. A further limitation was that participants had the opportunity to influence one another's responses. Stewart and Shamdasani (2014) and Bryman (2012) discuss further limitations that might be associated towards implementing focus groups. They discuss the influence and effect of intrapersonal factors and individual differences; e.g. demographic factors, physical characteristics, personality, group cohesiveness and social powers. Furthermore, as an intention of this research study was to discuss and explore an individual's car use it was considered focus groups would not allow for a detailed discussion to take place between the researcher and the individual participants and therefore, it would not be possible to achieve the research objectives. Alternatively, face-to-face interviews were considered more practical and useful for gaining a detailed insight into an individual's travel preferences. In light of the above, it was considered logical that focus groups and interviews could not take place simultaneously. It was therefore considered reasonable to exclude focus groups, as it was felt this research method would not satisfy the overall aim of this study.

In order to achieve a holistic travel perspective and to potentially gain a detailed insight into transport stakeholders this research study is based upon a mixed methods approach that combined a broad range of participants from members of the public to transport experts, achieving **OBJECTIVE 2**. From a review of the current literature (as detailed in Chapter 2), no research study has been found that has previously sought to understand how urban demographic characteristics along a selected travel corridor might influence the travel attitudes of individuals who have been identified to have a strong car dependency. In turn, it is the intention of this study to inform transport strategies of the potential practicalities and barriers that might favour a reduction in car use. This is endeavoured throughout this research study.

Table 3.2: Benefits and Limitations for using a Mixed Methods Approach

Advantages	***Disadvantages***
Combining both qualitative and quantitative data can explain complex survey response	Time consuming in design and analysis of key data information
A potential greater justification to inform new research or planning policy	Costly, which could result in a reduced sample size
Does not restrain the research to identify research strategies	Potentially too much data and key points omitted
Allows participants to be as active towards the research as they wish to be	

(Source: Adapted from; Driscoll et al., 2007)

3.5 Research Area

The research study adopted a case study approach of a transport corridor (A38) located in Birmingham, United Kingdom (UK). Birmingham has an estimated population of 1 million people (ONS, 2012). It is located approximately 120 miles northwest of London and has ambitious transport plans to encourage a reduction in car use and favour a greater usage in alternative forms of transport. Some of Birmingham's transport targets are outlined in its Mobility Action Plan in a report entitled 'Birmingham Connected' (2014). This report outlines the proposed transport development plans for the next 20 years within Birmingham. Planned proposals include the redevelopment of Birmingham New Street train station, at an estimated cost of £600 million, new tram lines, rapid bus transit routes, improvements towards cycling and the pedestrian urban realm and promoting 20mph streets. The aim is that by 2023 5% of Birmingham's modal will be by bicycle and subsequently double thereafter to 10% by 2033 (Birmingham Connected, 2014). Each day, approximately one million car trips are made by residents of Birmingham, despite a quarter of those trips being less than one mile (Walter, 2015). Therefore, it would be reasonable to suggest that most of these car trips could be achieved by alternative forms of transport. It is projected that an extra 150,000 people will live in Birmingham by 2030 and there will be 80,000 more cars in the city, generating an additional 200,000 daily car trips (Birmingham Connected, 2014). The West Midlands area is aiming to achieve a total of 5% of all trips by 2023 by bicycle from a baseline of 1% and targeting 10% by 2033 (The West Midlands Cycle

Charter, 2015). Furthermore, the A38 was identified as a key transport corridor for the city by Jones (2005) who provided and insight to a cyclist journey around Birmingham. This provided justification for focusing this study on Birmingham as it appears to be an area to have a demographic population who are car dependent, but there are also ambitions transport strategies and targets to promote and enhance sustainable transport to promote low carbon travel.

For the purposes of this research, the decision was made to investigate the travel attitudes of individuals who live either approximately a kilometre away from, or alongside the A38 road. The A38 was chosen because:

1 It is a major transport artery that dissects Birmingham (see Figure 3.4). A distance of a kilometre was considered adequate, as it was perceived participants would share similar travel experiences (e.g. peak congestion or access to alternative forms of transport). Therefore it was the intention that the responses obtained would be based on and all reflect a similar urban area context.

2 The A38 has been recognised as a transport corridor that requires improvements to promote and encourage alternative forms of transport. This transport corridor is a major access route to Birmingham City Centre (Birmingham Development Plan, 2013 & Jones, 2005). Further still, the key transport corridor in and around Birmingham. For example, the A38 exceeds the air quality objective of an annual average of 40 mg/m^3 which is a key objective that the council intend to address and improve (Birmingham City Council, 2015).

3 Additionally, the A38 links together a broad range of people from different deprivation levels. It would not have been possible to sample participants from all ten deprivation levels from any other singular transport corridor in Birmingham. Therefore, achieving **OBJECTIVES 1 & 3**, as it was the only singular travel corridor in Birmingham, which met the research criteria.

A number of limitations were recognised by taking this approach, for example, the results could reflect localised travel opinion and therefore not be capable of informing other travel areas. However, it was the intention of this empirical research study to focus on travel preference at a community level and a specific travel corridor. It would be logical for further research to be conducted in order to confirm the validity of the findings from this study (refer further to Chapter 7).

3.5.1 Urban Realm

It is reasonable to suggest that travel attitudes of individuals who live within different geographic areas (e.g. rural or urban) may not share the same travel needs or requirements. This research focused on travel attitudes of different groups of individuals who lived across different deprivation levels within an urban area. It was considered critical to explore an urban area for the following two reasons:

1. Urban areas typically have the greatest range of car related problems (Cervero and Duncan, 2003; Martinuzzi et al., 2007; Badland et al., 2014).

2. It is predicted that by 2050 70-80% of the world's population will live in urban areas (Zhao, 2010). Therefore it is likely urban areas will be exposed to more transport related problems in the future.

It was acknowledged the findings of this study might have been different if conducted in an area that has a lower uptake in vehicular usage and greater levels of walking and cycling (e.g. London, Oxford, Cambridge or Amsterdam). However, as outlined above, and earlier in Chapter 1, it was the intention of this study to focus on an area that had a relatively low uptake of alternative forms of transport. The intention was to gain an insight into the travel attitudes of individuals who were predominantly car dependent. For example, approximately 70% of journeys made into Birmingham are by car. Furthermore, Birmingham has been identified as one of five cities in the UK that intends to introduce a Clean Air Zone by 2020 (Birmingham Connected, 2016). This therefore suggests urgent action will be required to foster a reduction in car use and promote low carbon travel, and further justifies the importance of this study by focusing on this area. This research is in contrast to previous work to date, which has often focused on individuals who typically do not have a strong

affiliation to the car, however, to make a real difference to travel attitudes and behaviour there is a need to go beyond these. The next sections of this chapter discuss the relevance and contribution of each method in turn.

3.6 Questionnaire

It was the aim of the questionnaire to gather a wide range of car user's opinions across different demographic characteristics. Questionnaires were hand distributed to individual households along an urban travel corridor in order to achieve **OBJECTIVE 1**. An example of the questionnaire can be found in **Appendix 1**. However, before developing a questionnaire it was considered worthwhile to explore the benefits and limitations of conducting questionnaires. Table 3.3 outlines the potential benefits and limitations towards implementing a questionnaire.

Table 3.3: Benefits and Limitations of using Questionnaire Approach

Advantages	***Disadvantages***
Large amounts of information can be collected from a large sample size in a short time period	May lack in-depth analysis; e.g. changes in human emotion or behaviour
Software packages can be used to quickly interpret the data	No way of telling how truthful a participant has been, which can result in a lack of validity
Can be analysed more 'scientifically'	Questions may be interpreted differently, therefore the results may reflect a high level of subjectivity
Often practical for the research community	There is a level of researcher imposition. The researcher decides what the main focus points should be

(Source: Adapted from; Popper, 2014)

Alternative strategies to distribute questionnaires were also considered (e.g. asking individuals in the street to complete a questionnaire, or online surveys (e.g. survey monkey)

or collecting a survey a week later. Asking individuals in the street was considered too intrusive and intimating for prospective participants. Furthermore, the questionnaire could not be targeted towards specific demographic characteristics and therefore did not satisfy the overall aim of the research study as it could not be guaranteed specific demographic characteristics would be targeted. It was further recognised the advantages that online surveys could have to the response rate of the survey. However online surveys were not used as they cannot target specific households and it was recognised not everyone has access or the necessary knowledge to use the Internet and therefore for some travel opinions might not be captured. Finally, it was not considered practical to collect surveys a week later for two principle reasons. Firstly, it was perceived this would increase research costs and time and secondly, questionnaires might have been damaged if left outside. Henceforth pre-paid envelopes were attached to each questionnaire that allowed participants to complete and return the survey at their convenience. This was determined to be the most practical approach. Additional research methods are explored by Fowler Jr (2013).

3.6.1 Pilot Questionnaires

Before conducting the main questionnaire, ethical approval from the University of Birmingham was sought and achieved on 27 February 2014 (reference ERN_13-1492). Pilot questionnaires were then conducted with the researcher's colleagues, friends and family members in order to identify the potential benefits and limitations of the proposed questionnaire. In total, 20 pilot questionnaires were conducted in the first week in April, 2014. Two main lessons were learnt as a result of the pilot questionnaires:

1. **To make the questionnaire simpler and easier to understand to a non-academic and non-specialised transport audience:** It was proposed each section should begin with a brief subheading to describe the topic area (i.e. general information or your travel habits). Furthermore, all questions should be written as concisely as possible.

2. **To reduce the number of future transport strategies proposed:** Originally, thirty future transport strategies (FTS) were proposed. This was considered too many. It was suggested prospective participants could lose interest and become disinterested in the survey. On the whole, the pilot participants suggested between fifteen and

twenty FTS would be appropriate; therefore, it was considered reasonable to select a number between these. The aim was that the questionnaire would maximise the number of questions, but at the same time there was a need to consolidate the number of pages due to financial constraints and individuals' perception. For example, the pilot participants indicated that they would often not take part in a questionnaire that they perceived to be too long. Based on the above, it was considered logical and most financially beneficially to include eighteen FTS.

To determine if the lessons had been learnt from each pilot questionnaire, a final draft was forwarded to each of the pilot participants to gain additional feedback. All pilot participants indicated that they were sufficiently content with the questionnaire and therefore it was considered unnecessary to re-survey the pilot participants.

Before the questionnaire was designed and distributed, techniques to improve the response rate were investigated. It was the intention this would improve the response rate. The next section discusses this and other key aspects of the questionnaire.

3.6.2 Techniques to Improve Response Rates

It is widely acknowledged that postal surveys typically have a low response rate (Shannon and Bradshaw, 2002; Fan and Yan, 2010). Therefore, two techniques were included in the final questionnaire that intended to increase the response rate. Firstly, a prize draw and secondly, a pre-paid envelope (addressed to the researcher). Pre-paid envelopes allowed the participants to post their completed survey at no additional cost to them. A unique number was assigned upon receipt of a completed questionnaire. This enabled a random number generator to be used to indicate which participants should receive a gift voucher. A total of fifteen winners were selected, each receiving a gift voucher worth £10. It was considered common-sense to use a prize draw and a pre-paid envelope as it has been widely acknowledged that they improve survey responses (e.g. Sahlqvist et al., 2011; Scott et al., 2011). Alternative approaches that have been suggested include personalised questionnaires that are addressed to individuals or contacting prospective participants directly prior to distributing a questionnaire (e.g. Edwards et al., 2002; Glidewell et al., 2012; Paul et al., 2014). A benefit of using a prize draw and pre-paid envelopes was that it allowed for the research budget to be controlled and the participants could complete

the survey at their convenience in their own time. It was recognised that by providing a financial incentive potential ethical issues could arise. However, it was decided to provide a, financial incentive since it was felt that all participants were exposed to the same financial incentive and thus had the same opportunity to take part and the chance to win. Providing gift vouchers was considered the most logical approach as vouchers could be assigned to each winning participant and a receipt was gained once they had received the voucher – thus a traceable account of the vouchers was available, if required.

3.6.3 Questionnaire Distribution

A total of 3,000 travel questionnaires were distributed by hand to households across twenty Lower Super Output Areas (LSOA's) over a 12-day period in May 2014. A household was defined as one or more people who lived in the same dwelling or shared the same living accommodation at the same address. Therefore houses, flats and apartments were considered as separate households. All participants were asked to return questionnaires before the specified deadline (1 July 2014). In total, 392 questionnaires were returned. The questionnaire achieved a response rate of 13%, which was typical of most postal surveys (e.g. Edwards et al., 2009). Each LSOA received 150 questionnaires, with each selected household receiving one questionnaire. Households that received a questionnaire were selected based upon a random number generator. Each road name within the selected LSOA was alphabetically ordered and numbered. A random number generator was then used to indicate the order in which roads should receive a questionnaire. This was considered to be the fairest method as it allowed every household in the selected area to take part in the questionnaire. Distribution dates of the survey were chosen to coincide after the Easter holidays. It was considered most families would have returned from their holiday, if they had been on one, thus in theory ensuring a larger sampled population to be achieved. Each LSOA was either no more than approximately one kilometre, or was located alongside the selected urban travel corridor (refer to Figure 3.4). The intention was that participants would be exposed to similar travel opportunities, for example, public transport services. In total, 20% of the households in the surveyed area (13,666) had the opportunity to complete the questionnaire. This is broadly accepted as a fair distribution sample (Simon and Goes, 2011; Baker et al., 2012).

Table 3.4 shows the number of households in each deprivation area. Typically LSOA's comprise a minimum of 400 resident households. They were initially designed to facilitate the calculation of deprivation. For the purpose of this research, the Index of Multiple Deprivation (IMD) was ranked on a ten-point scale based upon national data. A score of 1 represented the least deprived area whereas 10 represented an area that was most deprived. The indices of deprivation are outlined by the Department for Communities and Local Government (DCLG); they are: income, employment, health and disability, education skills and training, barriers to housing and services, living environment and crime (DCLG, 2011).

Table 3.4: The Number of Dwellings per LSOA Sampled

Deprivation level	LSOA Number – South	Dwellings	Deprivation level	LSOA Number – North	Dwellings
1	Bromsgrove 008B	456	1	Lichfield 005E	712
2	Birmingham 109E	643	2	Birmingham 003A	1035
3	Birmingham 079B	790	3	Birmingham 021D	543
4	Bromsgrove 003A	871	4	Birmingham 012E	664
5	Birmingham 109B	623	5	Birmingham 021C	619
6	Birmingham 113B	573	6	Birmingham 028C	594
7	Birmingham 099D	707	7	Birmingham 029F	596
8	Birmingham 124D	954	8	Birmingham 025E	665
9	Birmingham 129B	628	9	Birmingham 029D	646
10	Birmingham 050A	667	10	Birmingham 028E	680
	Average	**691.2**			**675.4**

LSOA's were selected based upon a stratified random sampling method. A recognised limitation of a stratified sample method is that identifying a suitable strata to analyse may be troublesome (Black, 1999). On the other hand, it was considered most appropriate to apply a stratified sampling method as the questionnaire targeted specific demographic characteristics. Snowballing or simple random sampling methods were considered as alternative sampling methods for this study. However, this research study aimed to give everyone the same opportunity within a selected area, who met the research criteria, to take part in the survey. A stratified sampling method was the most effective sampling method to achieve the research objectives (as presented in Chapter 1).

3.6.4 Target Audience and Design

Before the participants responded to the questionnaire, they were asked if they met the following criteria. If a participant failed to meet the research criteria they could not take part in the study:

- Be equal to or over the age of eighteen.
- Hold a full UK driving licence.
- Live at the address the questionnaire was distributed to.

All questionnaires were delivered in person to households inside of a blank envelope. The questionnaire targeted households, not specific individuals, and a member of the selected household was asked to complete the questionnaire. It was considered that taking this approach would be less intrusive as the decision to who completed the questionnaire was decided by the household members. It is worthwhile to note that this research study was not interested in the households travel habits or behaviours and the information sheet (provided with each questionnaire) informed each participant of the purpose of the research study. It was acknowledged a further approach could be made to gain specific household information from the Electoral Register, in order to gain household information such as age. However, this approach was also considered too invasive for potential participants and the researcher wanted participants to feel they had the choice to take part, not to make any participant feel they had been forced to participate. All questionnaires contained the following information:

- **Participation information sheet** - documenting key words or phrases and providing a brief overview of the intention of the research study, refer to **Appendix 3**.

- **Consent form –** a requirement of the ethical procedure, refer to **Appendix 2.**

- **Pre-paid envelope –** addressed to the researcher at the University of Birmingham.

All questionnaires asked identical questions, however a geographic reference was discreetly included with each questionnaire that corresponded to the deprivation area in which they were delivered (i.e. S1 represented south deprivation level 1). This link was kept in a locked cabinet for the duration of the study and was subsequently destroyed.

3.6.5 The Questionnaire Structure

The questionnaire consisted of both open and closed questions. Closed questions aimed to allow the participants to quickly and easily respond to the survey. This was in response to the findings of the pilot questionnaire. Open questions were included to gain a fuller picture of individual's travel attitudes and behaviour. It was recognised that both open and closed have associated limitations. Therefore it was considered important to be aware of them in order to inform this research study of the best research practices. Table 3.5 presents potential benefits and limitations that relate to each research method. It is worthwhile highlighting that both questioning techniques have been critiqued throughout previous research studies (e.g; Fink, 2012; Hertlein and Ancheta, 2014). This research study was based on both questioning styles, with the view to minimising the potential limitations that may be associated with a particular questioning style and this seemed to be a logical approach.

Table 3.5: Benefits and Limitations to Conducting Closed and Open Questions

Closed Questions		**Open Questions**	
Advantages	*Disadvantages*	*Advantages*	*Disadvantages*
Easier and quicker for respondents to respond	A level of subjectivity may enter the data when analysed	Unlimited number of answers	A difference in the level of detail gained from each respondent
Easier for the researcher to compare respondents	Respondents maybe frustrated if the responses do not match their personal thoughts	A greater clarity and detail responses can be gained	Response be irrelevant thus useless to the research
Good for researching sensitive or intrusive topic areas	Respondents may feel forced to give a simplistic reply to a complex problem	Unforeseen findings and conclusions can be drawn	Time consuming for participants.
Respondents are more likely to answer sensitive questions	Too many options could confuse participants	An greater understanding concerning participants logic or thinking process	A level of intimidation may enter the research
Fewer irrelevant or confused answers	Distinctions between participants answers may become blurred		Responses may take up a lot of space thus less questions may be answered or able to be asked
Easier for the researcher to replicate	Respondents can answer even with a lack of knowledge		Statistical comparison is likely to be difficult

(Source; Adapted from; Reja et al., 2003)

In total, the questionnaire consisted of four sections: general information; respondents travel habits; FTS and future research. Each section is justified in turn below. FTS consisted of about eighteen hypothetical FTS (refer to Table 3.5) and they were split across four key transport areas (refer to Chapter 2 for the justification to why the four key areas were chosen). The participants were given limited guidance on either the meaning of or, how to interpret specific questions. This was deliberate in order to avoid manipulating a participant's response. However, there was an acceptance that a level of subjectivity was present within the data. For example, some participants may have interpreted questions differently. In order to limit this, all participants were provided with a general information sheet. The intention was this would provide the opportunity for every participant to have the same background and knowledge of the research study (e.g. key terms). However, it was recognised by providing each participant with an information sheet this had the potential to manipulate the findings of the study. On the other hand, all sampled participants were from different backgrounds, thus this provided them with the same starting point when responding to the questionnaire as they had no previous knowledge of this empirical study. Knapp et al. (2011) and Beatty et al. (2014) further explore the disadvantages of providing participants with information sheets. The purpose and justification of each individual section that contributed towards the questionnaire is outlined below:

1) **General Information:** To gather general information about the participants (e.g. their age, household income or weekly car use) in order to confirm individual participants were a fair representation of the sampled area. This was necessary as research studies have indicated some participants may feel the need to please the researcher (Pierce et al., 2012). In addition, an overarching aim of the research was to compare and contrast the effect demographic characteristics have on individuals car use. Research studies have indicated there to be a significant relationship between different demographic characteristics and car use. Kuhimhof et al. (2012) indicates that typically younger adults (i.e. ages under 25) are more willing to reduce their car use compared to older adults. Rojas-Rueda et al. (2011) and National Travel Survey (NTS) (2013) discuss the impacts of health and car use. They suggest individuals who suffer with greater health related problems are likely to be more dependent upon the car.

2) **Your Travel Habits:** Aimed to gain an understanding into how demographic characteristics influence car use attitudes and behaviour in order to inform FTS. Chatterjee et al. (2013) indicate there to be a lack of knowledge of triggers of travel attitudes. In total, this section comprised ten open and closed questions. The initial five questions were based upon closed questions and the participants were asked to respond on a ten-point scale. It was the intention that this would allow the participants to quickly and easily respond to the questionnaire. This achieved one of the outcomes of the pilot questionnaire findings. The preceding five questions were open questions. This allowed for a fuller picture to be gained regarding travel attitudes and behaviour associated with different groups of individuals. Participants were asked a range of questions; from factors that influenced their car use the most, to the effect 'other' household members (i.e. children or partners) had on their car use attitudes and patterns. Previous research studies appear to indicate there to be link between household members and car use (e.g. Pooley et al., 2011b).

3) **Future Transport Strategies:** In total, eighteen hypothetical FTS were proposed to investigate how demographic characteristics influenced car use attitudes and behaviour. All FTS were based on previous transport strategies, as discussed previously in Chapter 2. It was the intention to inform FTS on ways to encourage and promote a reduction in car use and enhance low carbon travel amongst groups of individuals who were identified to be heavily car dependent. Research studies suggested future research is required to inform FTS of the influence demographic characteristics have on car use attitudes and behaviour. (Banister and Hickman, 2013). All FTS were based on closed questions, split across four key transport areas and were asked in no particular order and at random. The participants were asked to provide a response on a scale of 1 to 5. A score of 1 indicated a participant would be willing to drive a lot less, whereas a score of 5 indicated a participant would drive a lot more. It was assumed not all of the FTS would be applicable to each participant due to different travel requirements despite sampled participants having a strong affiliation to the car. If a FTS was

left blank, this was treated as missing data and not included in subsequent calculations. This might have been because participants misunderstood the scoring strategy. The order in which the FTS were asked throughout the questionnaire was randomised between the key transport areas, in order to control fatigue when the participants were completing the questionnaire. It was accepted that some FTS might be linked and thus if asked separately could provide a different response. Table 3.6 provides a description of the eighteen FTS and how each strategy was conceived based on previous research studies (shown in *italics*).

Table 3.6: Description of the Eighteen FTS

1	No change to urban road structure (Järvi et al. 2015)
2	Congestion charge implemented at £5 per day but cycle lanes and public transport facilities were commonly available *(e.g. Hensher and Puckett, 2007; Pucher and Buehler, 2008 & Maibach et al. 2009)*
3	Compulsory for all employers to provide shower and changing facilitates (e.g. *Gatersleben and Appleton, 2007; Dickinson et al. 2003 & Savan, 2017*)
4	No change to your commuting distance but public transport and cycle lanes were commonly available *(Pucher and Buehler, 2016; Sagaris, 2015 & Sengoku, 2016)*
5	All cycle lanes/ parking removed *(Macbeth,1999, Marshall and Banister, 2000 & Falcocchio et al, 2015)*
6	Elevated cycle lanes were commonly available *(Goodman et al. 2014 & Parkin and Meyers, 2015)*
7	Road tax increased by an additional £5 for the next three years *(Jakobosson et al. 2000)*
8	No obligation for employers to provide shower/changing facilities *(Heinen, 2013 & Cleary et al. 2000)*
9	Congestion charging scrapped after 3 years with no improvements to public transport or cycle lanes *(Eliasson et al. 2009; Schuitema et al. 2010 & Stopher, 2004).*
10	Fuel increased by 10p per litre for the next 3 years *(Sanden and Karlstrom, 2007)*
11	A weeks free trial was available to use public transport or hire a bicycle *(Armelius and Hultkrantz, 2006)*
12	Public transport fares decreased by 25% *(Beirão and Cabral, 2007)*
13	Cycle parking was commonly available *(Wardman et al. 2007)*
14	Automobiles were limited to 20mph for 3 years *(Grundy et al. 2009)*
15	On road cycle lanes were commonly available *(Banister, 1997)*
16	Your commuting time increased by 30 minutes but cycle lanes and public transport facilities were widely available *(Gatersleben and Uzzell, 2007)*
17	Your working hours were flexible *(Banister, 2008 and Stopher, 2007)*
18	Supermarket shopping was discounted by 5% if you used the home delivery service *(Cairns, 1996)*

4) **Further Research:** The main purpose of the final section was to gain participants for additional research (i.e. travel diaries and interviews). In turn, justifying the importance and significance of the questionnaire to the overarching research study. If a participant was willing to take part in further research they were asked to leave their contact details at the end of the questionnaire so they could be contacted at a later date. In addition, the participants were asked to leave their contact details if they wanted to receive a brief summary of the questionnaire results. If the

participants did not leave their contact details it was assumed that they did not want to be contacted further and therefore they were not entered into the prize draw.

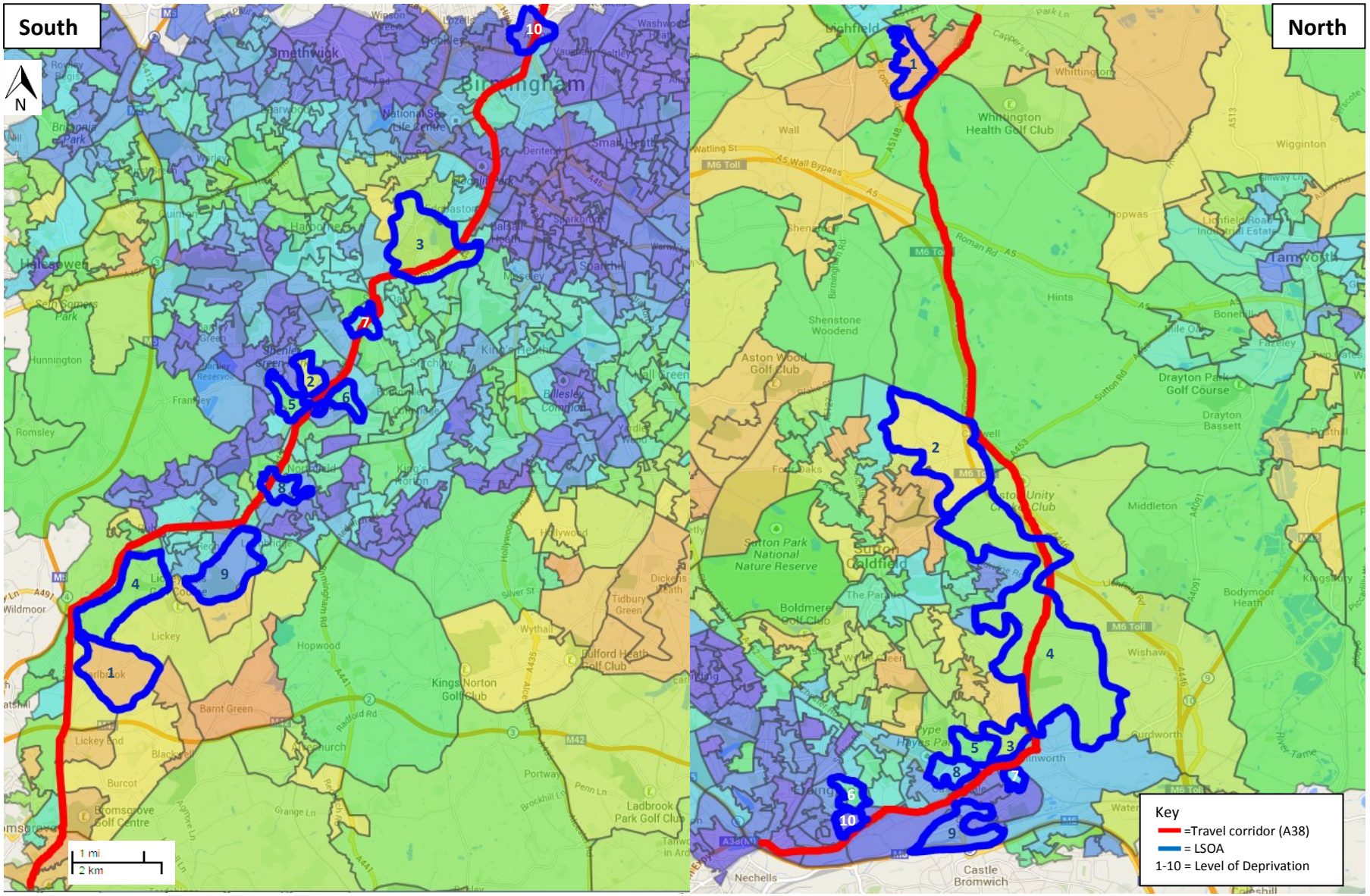

Figure 3.4: LSOA's Sampled

3.7 Travel Diaries

The travel diaries aimed to gain an insight into an individual's car trip patterns over a period of seven consecutive days (i.e. Monday to Sunday) (refer to **Appendix 5)**. A seven-day consecutive period was chosen as it was considered, on the whole, most people typically work five days a week (i.e. Monday to Friday) and have the weekends (i.e. Saturday and Sunday) for leisure and relaxation activities. By asking participants to document a seven-day consecutive travel diary it was considered this would capture both their professional and leisure travel demands and needs. Therefore, a greater time period (i.e. a fortnight) was considered to have little or no benefit. Travel diaries explored a range of travel issues, from the purpose of an individual's car use to their perceived trip cost for a specific journey. All participants who participated in the travel diary took part in a follow up interview (refer to section 3.6). This was a condition of taking part in the travel diaries and all participants were informed of this prior to taking part. Therefore, the data gained as a result of the travel diaries was instrumental to inform the interview discussions. Before conducting further research (i.e. travel diaries and interviews) additional ethical approval was sought and granted in accordance with the Ethics Committee at the University of Birmingham on 24th February 2015 (reference number ERN_13-1492). All participants were asked to complete and return their travel diaries by the end of March 2015. An invitation inviting participants to take part in further research can be found in **Appendix 4.**

No pilot travel diaries were conducted, unlike the questionnaires surveys, as it was considered this would add little or no benefit to the research study for various reasons. The design of the travel diary was based on previous research studies (e.g. Wolf, 2006; Axhausen et al., & Mousumi and White, 2005) and the research methods discussed earlier in this Chapter e.g. refer to Section 3.2. Finally, lessons learned from conducting the pilot questionnaires were adhered to; for example, starting with a brief introduction and keeping questions short and concise when developing the travel diaries. However, a colleague was asked to review a draft of the travel diary to determine if the travel diary was logically structured and legible, which they agreed.

3.7.1 Obtaining Participants

The eighteen travel diary participants were obtained as they had taken part in the questionnaire. The participants who indicated a willingness to participate in further research

were subdivided by different demographic characteristics (e.g. age and deprivation) and given a unique number. This permitted a random number generator to be used to indicate who to invite to take part in further research. This allowed for every participant who met the research criteria to have the same opportunity to take part in further research.

A personalised email was sent to the chosen participants to invite them to take part in further research. Personalised emails were sent to all participants. It was considered financially prudent in order to reduce the overall research cost (e.g. postage costs) as limited financial funding was available, at this stage of the research study. Furthermore, it was considered emails are likely to reduce the time a participant would receive their travel diary as it could take several days if posted by standard post. A delivery and read receipt was automatically gained which provided insurance that each participant had received the travel diary – this is something that would not have been possible if posted by standard post.

Alternative methods such as hand collecting travel diaries, debriefing participants (Geoffrey & Ampt, 2001: Crosbie, 2006) or collecting data by mobile phones (Glasgow et al., 2016) were all considered and explored. Each method has been recognised as a popular method of data collection, however they were excluded from this study as a result of the following justifications.

Hand collection methods were omitted as the travel diaries could have been stolen, lost, damaged or stolen and therefore, it was consider most logical to electronically send travel diaries to complete to each participant. On the other hand, a time could have been arranged to personally collect the travel diaries from each participant however, it was considered this might cause inconvenience to participants. In addition, most travel diaries were electronically returned and therefore there was no need to personally collect each travel diary. This method was also considered more environmentally friendly which related well to the broad aim and ethos of the research.

Debriefing each participant at the start of the travel diaries was excluded as each participant was debriefed regarding the research study at the beginning of each interview. Therefore, it was considered unnecessary to give participants two separate debriefs about the findings of the research study. It was considered sufficient to debrief the participants at

the start of each interview, as this provided one concise feedback response. Furthermore, each travel diary took a considerable time to analyse and evaluate, thus it was unlikely debriefing between the researcher and participant could take place on the collection of the diary. Finally, collecting data from mobile applications was excluded as it was considered some participants might not have the ability to access a mobile phone and therefore might exclude some participants from taking part. In addition, some participants might not want to document personal information on their phones, which had the potential to be hacked.

Therefore, it was considered logical to electronically send all travel diaries to participants unless they stated otherwise (a hard paper copy was available upon request). A limitation of providing hard copies of the travel diaries was that they might get lost in the post. This occurred on two separate occasions concerning two fully completed travel diaries. It was recognised this could occur, but it was also accepted that different participants might have different preferences to how they wanted to complete this travel diary and this study aimed to capture a broad range of travel attitudes and opinions, and thus needed to be fluid and flexible to meet the needs of different participants. The two respondents were contacted and were sympathetic; they agreed to provide their travel notes and this was considered appropriate for their data to be used in the research study, as sufficient detailed information was gained from their notes.

3.7.2 Sample Population

In total, eighteen participants completed a weekly travel diary. The participants were only invited to take part in the travel diaries if they used their car either every day, or every other day (car use data was gained as a result of the questionnaire). This was because the aim of this study was to investigate individuals who were highly car dependent.

3.7.3 Instructions for Completing the Travel Diaries

A confirmation email was sent to the participants who had agreed to take part in further research. The email contained the following information:

- A travel diary and

- Confirmed research dates (i.e. travel diary and proposed interview time period) – all participants were asked to return their completed travel diaries before 31 March 2015.

None of participants received an information sheet. It was perceived that the participants already had an initial grasp of the research (i.e. key terms) as they had taken part in the questionnaire. Instead, the participants were provided with an exemplar of a completed travel diary (refer to **Appendix 5**). An information sheet was not provided as the study did not want to manipulate the individual's responses (e.g. calculating fuel costs). For example, research studies have found, typically, most individuals underestimate their actual trip cost as they often exclude costs such as depreciation, tax or servicing (e.g. Gardner and Abraham, 2007). To calculate an individual's trip cost, the participants were asked to detail information regarding their car (i.e. make. model, engine size etc.). It was acknowledged some participants might use more than one car in a standard working week. However, it was considered reasonable to assume the car they had detailed at the start of the diary related to their trips detailed throughout the travel diary, and it was accepted they could only drive one car at the same time. At the start of each interview, the participants were asked to confirm they used this vehicle throughout the travel diary.

A further requirement was that the participants recorded the start and finish positions of their car trips (i.e. postcode and road name). Further research could benefit from using a *GPS tracker*. By using a GPS *tracker this* would allow for an accurate recording of the participants' trip positions, reducing the likelihood of human error entering the research findings. It could also monitor driving behaviour. It was considered that including a GPS tracker might make it easier for participants to complete their travel diary as they would not need to know their precise position (i.e. street name). However, there is utility to recognise ethical constraints (e.g. tracking individual movement). In addition, further training might be required to inform participants of how to use the equipment. It was considered this would increase the research budget. Allowing the participants to document their own positions was considered less intrusive and therefore it was deemed different groups of individuals would be more willing to take part in the research study. Therefore it seemed reasonable to exclude the usage of GPS *trackers* for the purpose of this research study due the justifications detailed above.

3.7.4 Procedure after Completing the Travel Diaries

All the participants were emailed and thanked once their completed travel diary had been received. An interview date was then arranged at a convenient for the participant to take part in a follow up face-to-face interview. This is a common strategy used throughout research studies (Britten, 1995). Initially, brief notes were documented concerning the information individuals had provided in their travel diaries. This provided background into the individual's travel attitudes. The information included in these briefing notes included: an individual's perceived trip cost, the purpose of their trips and the availability of alternative forms of transport. The notes were used to inform the interview discussion.

3.8 Interviews

The purpose of the interview discussions was twofold:

- Explore how different hypothetical future transport strategies, methods and incentives might affect an individual's willingness or ability to reduce their car use.

- To determine the practicalities and barriers that might exist when implementing the proposed FTS.

In total, twenty-three interviews were conducted - examples of the interview structure can be found in both **Appendices 6 and 7**. The interviewees were split into two groups. Firstly, travel diary participants (eighteen) and secondly, transport experts (five) (e.g. planners, policymakers, consultants and charity transport groups). The first group of interviews were conducted in April 2015 and the second group were conducted throughout September 2015. All interviewees were given a brief overview of the research findings and informed of the importance of each research method in the study. It was accepted that not all of the transport strategies discussed throughout the interviews would be relevant or be important to each interviewee. If a question was not relevant to the interviewee the interviewer moved to the proceeding question.

3.8.1 Constructing the Interview Design

Before conducting the interviews, three pilot interviews were conducted with colleagues and friends. The key objectives of the pilot interviews were:

- To allow the interviewer to gain an opportunity to practice asking questions in a setting similar to an interview.

- To gauge the viability of the proposed questions.

- To determine if a period of one hour (as proposed) was a long enough to hold effective dialog between the interviewee and interviewer.

- To gain feedback regarding the interviews.

It is widely acknowledged and recommended that all researchers, regardless of experience, should conduct pilot interviews, as conducting an interview is a highly skilled task (Gale et al., 2013). Hence it was considered important to conduct them. Three main lessons were learnt and implemented as a result of the pilot interviews.

1 To ask all questions as concisely as possible.

2 Ask each interviewee to complete a consent form at the beginning of each interview (refer to **Appendix 2**). It was initially proposed to ask participants to complete their consent form at the end of the interview.

3 Send a reminder email to participants one week prior to their proposed interview date.

At the start of each interview, the participants were shown two imaginary street scenes (refer to **Appendix 6**). The two images were chosen because they were based upon similar urban areas to the research study. However, they portrayed a very different urban travel context to that which currently exists in most UK urban areas. It was considered necessary to show the participants imaginary street scenes for the following two broad reasons:

1. To help them gain an understanding of how future transport systems might look.

2. To gain their views or opinions on specific issues across different demographic characteristics.

3.8.2 Interview Length

The optimum length of an interview has been widely discussed in the field of research methodology (e.g. Brick et al., 2007; Rowley, 2012). Despite this, there is no universally accepted interview length. It is broadly accepted that an hour to an hour and half is a sufficient time period for conducting an interview (Longhurst, 2010). An interview that exceeds one and a half hours may result in either the interviewee or interviewer losing their concentration (Laforest et al., 2012). It therefore seemed logical to attempt to limit each to approximately one hour. None of the interviews lasted longer than this time. The shortest interview lasted 42 minutes and the longest interview was 75 minutes. The average interview length was 53 minutes.

3.8.3 Sample Population

Researchers often debate with how many participants to sample (e.g. Guest et al., 2006; Baker et al., 2012). Some researchers suggest the number of interview participants should be determined by the number of researchers involved in the research project, or when saturation occurs (Mason, 2010; Adler and Adler, 2011). Often a researcher might decide the number of interviews based upon the research project or the usefulness of the questions to the study. Research studies have highlighted four key areas to consider before determining the number of interviewees. It seemed logical to use them for this research study. Each area is outlined in turn below:

1 Based upon previous research (see: Guest et al., 2006; Maclean et al., 2012).

2 The interviews formed part of a larger research study.

3 Limited by financial constraints. No money was available to provide financial incentives for the participants; for example, gift vouchers – however all interviewees received a £10 gift voucher in recognition of their time and contribution to the research.

4 Practical constraints regarding the research deadlines.

In total, twenty-three interviews were conducted with transport stakeholders (e.g. sampled population from the questionnaires and travel diaries, policymakers and consultants). The initial eighteen interviews were represented evenly across each deprivation level and different age ranges, but not gender. Therefore each deprivation level was represented by at least one participant and six participants represented each age range. Deprivation was categorised into three levels, 1-3; 4-7, and (8-10) - therefore six participants represented each group. In total, eleven participants were female and seven were male. Ideally gender too would have been evenly distributed (i.e. nine male and nine female participants) with the intent to achieve a balanced gender response. However, in reality, gratitude was shown to anyone who was prepared to take part in further research. The additional five interviews included two female and three male transport experts who had a combined average transport working experience of nineteen years. It is accepted that this was potentially a relatively small sample size when considering the number of participants who met the research criteria. However, if at any stage the researcher felt more interviews were required, the option was available and more participants could have been sampled. It was not considered necessary to interview all participants who met the research criteria if additional participants would provide no new information to the research study.

The additional five transport experts were selected as they were considered an integral part of the transport system within the research study. It was considered more beneficial to exploit the knowledge of local transport experts rather than national experts (e.g. DfT). This was because the overall purpose of the study was to investigate the travel attitudes within a specific case study area and at a local community level. All five interviews were recruited by a personalised email or a telephone conversation. Experts were recruited from organisations who were considered to have an impact on local transport policy, as well as the researcher's professional contacts. It was the intention to gain transport experts from a broad range of transport organisations with the aim of gaining a detailed insight into local transport barriers and constraints.

By interviewing local transport experts it was considered more beneficial to this study as they had the potential to have the greatest influence within the case study area, so as to further understand the theoretical limitations and constraints associated with the local demographic. Omitting national transport experts might have limited the usefulness of this

research as it did not investigate the potential national perspective concerning the practicalities and barriers associated with hypothetical FTS. However it was the intention of this research study to focus on a case study rather than on national travel attitudes and behaviour. However the goal was that the lessons learnt, as a result of this study, could be applied and used in other areas.

3.8.4 Interview Location

The majority of the initial eighteen interviews were conducted at participant's homes (unless stated otherwise). In total, three of the initial eighteen interviewees asked for the interview to be conducted in an alternative location, so the University of Birmingham was used. The main justification given (by the interview participants) was it was more convenient to hold the interview in an alternative setting rather than their homes. The additional five interviews were all conducted at the interviewees' places of work. It was deemed reasonable and practical to conduct the interviews at the homes of the participants or place of work for the three following reasons:

1. To reduce the inconvenience for the participant (i.e. travelling from one location to another).

2. The interviewee may feel more comfortable in a familiar setting and therefore be more willing to share information. It was the intention this would enable an in-depth conversation regarding individuals travel attitudes and behaviours.

3. Financial constraints – there was no money available to reimburse the participants; e.g. for travel expenditure.

Some research studies have argued interviews should be conducted in a neutral location or setting (e.g. central library or a coffee shop) that has limited familiarity to both the interviewer or interviewee (Denzin, 1970; Valentine, 1997). However this research study did not concur that interviews should be conducted in a neutral setting for the three justifications that have been mentioned above.

3.8.5 Techniques to Build Effective Rapport

It was deemed critical to build an effective rapport with the interviewees throughout the interviews. It is broadly accepted that not one interview discussion is the same (i.e. different settings, time or participants). Therefore, there are no quick guidelines or rules regarding how to build an effective rapport (Valentine, 2005). It is acknowledged that some interviewers might find it difficult to follow strict guidelines or even ask the same questions from one interview to another – a potential advantage of conducting semi-structured interviews. Dunn (2005:81) further elaborates:

"It is not possible to formulate a strict guide for every interview context".

In order to build effective rapport between the interviewer and interviewee it seemed logical to use the following three techniques.

- **A description or purpose of the research** - previously noted as a key strategy to build effective rapport (Longhurst, 2010).

- **Preferred Name -** interviewees were asked their preferred name; e.g. Joanne or Jo.

- **Dress Code –** a smart casual approach was taken (i.e. shirt and jeans) for the initial eighteen interviews. It was hoped this approach would make the interviewee feel more comfortable to disclose a greater level of detailed information concerning their travel attitudes and behaviour. However, a formal dress approach was taken (i.e. shirt and tie) for the additional five interviews. This was because all of the interviews took place with transport experts in their professional working environments.

Building rapport was considered a critical element to the research study. If an interview participant felt uneasy with the researcher, at any stage, they may have been less willing to disseminate and share their personal travel information.

3.8.6 Interview Structure and Methodological Approach

The initial eighteen interviews were structured based upon the results collated from the questionnaire and travel diaries. The additional five interviews were based on the

findings collected from the whole research study. All interviews started with a brief introduction, purpose and background of the research study. The interviews were face-to-face semi-structured interviews. The benefits of conducting face-to-face interviews have been widely discussed by researchers (e.g. Hutchinson and Wilson, 1992; Smith, 1992; Barriball and While, 1994; Irvine et al., 2013). Semi-structured interviews are commonly viewed as the preferred research method by many researchers (Cohen and Crabtree, 2006). Further justifications for using face-to-face semi-structured interviews throughout this research study are outlined below:

- An immediate reaction between the question and answer can occur. Theoretically allowing the interviewer to probe, reconfirm and clarify a question. It was intended this would allow for a further in-depth of knowledge to be established regarding individuals' travel attitudes and behaviour (Wengraf, 2001).

- Facial expressions, physical characteristics or social clues (i.e. a change in voice, intonation and body language) can be recognised by the interviewer and further questioning can occur, if felt appropriate (Opdenakker, 2006).

- The ability to build a relationship between the interviewer and interviewee is often viewed as critical when exploring personal perceptions and attitudes (Gillham, 2005).

Consideration was given to alternative interview methods, for example, this study could have adopted a structured approach rather than a semi-structured approach. A structured interview asks exactly the same questions in the same order to each interview participant. This is different from a semi-structured approach that uses similar topics to investigate different research areas and the interview questions can be tailored to or each interviewee. Irvine et al. (2013) further explores the differences amongst interview techniques. Therefore, a semi-structured approach was felt to be the most suitable in order to gain a fuller picture of an individual's travel attitudes and behaviours. It was anticipated no single interviewee's answers or their travel attitudes behaviour and needs would be the same. Therefore semi-structured interviews were considered most logical as interview questions could be tailored to each interviewee.

Furthermore it is acknowledged that the rise in technological advances, such as FaceTime or Skype, may allow researchers to conduct an interview face-to-face in real time across different geographic areas and reduce research costs (e.g. travelling costs). This was discussed by Irvine et al. (2013). On the other hand, Skype or FaceTime were not considered compatible with the study. It was considered such techniques might exclude participants who either did not have access to the Internet, or who were unfamiliar with the technology. In addition face-to-face contact between the interviewee and interviewer was considered a vital component to build trust and an effective rapport. Research studies suggest that the loss of face-to-face contact (i.e. via the telephone or messenger) results in a loss of the 'natural' encounter between the researcher and interviewee, hypothetically losing in-depth information (Shuy, 2003).

3.8.7 Interview Recording and Analysis

All interviews were recorded using two digital recorders – one acted as a backup. Before the start of each interview, the interviewees were asked if they were happy for the interview to be recorded. Only then did the interview officially begin. It was a requirement of the ethical agreement that all interviewees were aware and agreed to the interview being recorded. If an interviewee did not agree to the interview being recorded the interview was terminated, however this occurrence did not arise in this research study.

Throughout all of the interviews brief notes were taken. Briefing notes were transcribed into Nvivo. This is a software package that helps researchers analyse their interview data. It is common practice for an interviewer to take notes whilst conducting an interview (Doody and Noonan, 2013; Guion et al., 2011). Briefing notes often highlight key phrases or features that occurred throughout the interview. This typically aids the final interpretation of the findings. Before briefing notes were taken the permission of the interviewee was sought.

All interviews were professionally transcribed. Each interview transcript consisted of approximately 15–25 pages. This is typical of most interview transcriptions (Dearnley, 2005; Gale et al., 2013). It was decided to use a professional transcription service for two main reasons. Firstly, to reduce transcription time and secondly, it was a service offered through student support services at the University of Birmingham. All fully transcribed interviews

were copied into Nvivo in their entirety and coded. Coding allows researchers to analyse their data. Some research studies have suggested coding can be a subjective task (Saldaña, 2012). For example, Sipe and Ghiso (2004:482) describe this process as bringing your own "*personalities, predispositions and quirks"* to the research process.

To limit the level of subjectivity a colleague was asked to review and examine the codes to confirm they were a fair representation of the text. The colleague was briefed for each code. They were then asked to determine if the codes accurately reflected the contexts of the participant's responses. The researcher was available on request to answer any additional questions that the colleague might have. However the researcher did not help or attempt to manipulate his colleague when they were determining if they considered the codes to be an accurate and fair description of the participants' responses. After each code had been reviewed by the researcher and their colleague, each code was discussed in turn. The researcher's colleague concurred that each code was an accurate representation.

It is acknowledged sometimes that researchers deploy pre-coding (i.e. a defined coding structure before interview analysis). Pre-coding was not used in this research study as it was considered it could manipulate the findings. Grounded Theory (e.g. Whittles, 2003) or Framework Analysis (i.e. Cavoli et al., 2014) are examples of coding strategies that have been used in previous research studies. Descriptive Coding (e.g. the use of one word to summarise a topic) was used for this research study.

It was considered this approach best lent itself towards Nvivo, but it also allowed for the findings to best fulfil the aim and objectives as detailed in Chapter 1. In total, there were three broad themes to categorise the data and a further 75 sub-categories. All codes related to individuals travel attitudes. To analyse the codes three broad themes (i.e. main topics) emerged, which were: perceptions of travel costs, justifications for not using alternative forms of transport and solutions to encourage a greater usage of alternative forms of transport. Nvivo was then used to specifically select key phrases and themes which emerged from the interview discussions.

3.9 Confidentiality

Confidentiality was taken with the upmost of gravitas throughout this research study. The following steps were taken to increase and ensure discretion:

1. No personal information such as a participant's names or addresses was referred to or documented in the main body of this research study and therefore no personal information could enter into the public domain. It was important to gain personal information (e.g. gender, age and wealth) in order to understand how travel habits might change across demographic characteristics but furthermore, to build an effective rapport with participants throughout the interview stage, which usually started with a reference to their preferred name.

2. Access to individual names and household data were kept in a locked cabinet at the University of Birmingham. The combination to which was known only by the researcher.

3. Upon final completion of this research study all personal information was confidentially disposed.

3.10 Withdrawal

At the start of each research stage the participants were informed of their right to withdraw from the research. It was anticipated some participants may decide to withdraw from the research process but also, it was considered the research study was ethically obliged to inform the participants of their rights to withdraw from this research study, at any time, if they wished to do so. In the event a participant had have withdrawn from the research study additional participants would have been contacted, however no participant whose information has been used for the purpose of this research study has expressed a wish to withdraw their information from this study. Therefore the withdrawal process was not important for this research study.

3.11 Chapter Conclusion

The chapter has presented and discussed some potential research methods and their design, which might be suitable for this study. This chapter has identified the importance to develop a broad range of methods to respond to each objective and the aim of the research study, as stated in Chapter 1.

A key outcome of this chapter is that it is important to develop a research study based on a mixed methods approach. A range of justifications have been outlined in this chapter, but two principle justifications for conducting a mixed methods approach were: a broader range of travel opinions were likely to be gained; and they had the potential to minimise misleading findings, as it was recognised some participants may unintentionally or intentionally attempt to mislead a researcher - concurring well to the findings outlined in Chapter 2. The three preferred methods that were considered most beneficial for the purpose of this study included questionnaires, travel diaries and interviews.

This chapter has identified a key intention of the questionnaire was to gain a wide variety of travel opinions from a broad and diverse range of car users. It was accepted that a broad range of stakeholders would receive the initial questionnaire and that the study area has a broad demographic background. Therefore, it was deemed most logical to not target the questionnaire specifically towards a particular demographic group, for example, the elderly or young. Further empirical research, such as the travel diaries and interviews, were considered to have a greater opportunity to target specific car user groups, for example, those who drove their car every day or every other day.

Furthermore, to gain a detailed insight into travel habits and attitudes it was considered logical to conduct personalised weekly travel diaries and interviews with a specific group of road users. In this chapter it has been highlighted that by only conducting eighteen travel diaries and twenty-three interviews this was a relatively small sample. However, if the researcher required further information, additional participants could be contacted.

Finally, a key requirement of each method was that it informed the next. For example, the questionnaire would be used to gain a specific group of road users to take part in further research (travel diaries and interviews). The proceeding chapter, Chapter 4, outlines the key findings of this research study based upon the data collected from the questionnaire.

Chapter 4

Chapter 4: Results and Analysis: Questionnaire Survey

4.1 Introduction

The aim of this chapter is to provide a detailed analysis and discussion of the results collected from the questionnaires, which were returned to the researcher by the specified deadline (refer to Chapter 3, Section 3.6 and Appendix 1). A significant amount of data has been collected in order to conduct this research study. As previously outlined in Chapters 1 & 3, this research study was based on a mixed methods approach. In total, three research methods (questionnaires, travel diaries and interviews) contributed towards the overall research study, and over this chapter and the next (Chapter 5), each method will be analysed and investigated. This chapter is ordered to reflect the three main sections of the questionnaire, which were: general information, your travel habits and future transport strategies (FTS). All of which are discussed in turn below.

4.2 Questionnaire Overview

Table 4.1 outlines the responses gained from the questionnaire based upon different areas of deprivation. In total, 392 questionnaires were returned out of a possible 3,000. Of that, 60% were employed, 24% were retired and the remaining 16% were not in paid employment (i.e. a house wife/husband, unemployed or a student). Table 4.1 illustrates that all ten deprivation areas that were sampled gained some level of response. The findings therefore achieved an insight into the travel attitudes and behaviour of different groups of individuals across all ten sampled deprivation areas, which were identified for the purpose this research study, in turn, achieving **OBJECTIVES 1 & 2.** The greatest response rate was achieved in deprivation Level 3 (17%); whereas deprivation Level 10 achieved the fewest responses (9%). This was despite each deprivation level receiving the same number of questionnaires with a prepaid envelope attached to each survey. This variability might reflect a potential limitation of the design and delivery of the questionnaire; for example, it might have been logical to distribute more questionnaires to areas with higher deprivation levels. Further discussions are detailed in Chapter 6, Section 6.2.

The greatest mean number of responses were gained from the five least deprived areas (15%) compared to the five most deprived areas (11.2%). The findings suggest future research would benefit from delivering a greater number of questionnaires to more

deprived areas. In addition, the findings might reflect different attitudes towards responding to a questionnaire. For example, the data might suggest that individuals from least the deprived areas might have a greater level of flexibility or willingness to complete a questionnaire. This work has mirrored other research studies by achieving a greater response rate from least deprived areas (e.g. Rogers et al., 2014 & Blair et al., 2013).

Furthermore, the questionnaire assumed that everyone who received the survey had the same level of educational standards (e.g. reading and writing). Despite acknowledging education levels are perceived as a measure of deprivation and typically deprived areas have a lower standard of education compared to less deprived areas. This might have manipulate how different individuals responded to the questionnaire and presents a potential theoretical limitation. However, a criterion of the research study was to deliver the same questionnaire to each participant in order to maintain consistency throughout the research. The last column of Table 4.1 indicates the number of participants who agreed to take part in further research. All participants were asked and given the same opportunity to participate in further research. In total, 113 participants agreed to take part in further research. Of that, 64 participants were from the five least deprived areas and 49 participants were from the five most deprived areas. This again indicated that people from less deprived areas were more prepared to take part in further research compared to individuals who lived in more deprived areas.

Table 4.1: General Overview of Response Rate by Levels of Deprivation

Deprivation Level	Questionnaires Delivered	Questionnaires Returned	Response Rate %	Agreed for Further Research
1	300	42	14	14
2	300	46	15	14
3	300	50	17	15
4	300	44	15	13
5	300	42	14	8
6	300	36	12	14
7	300	38	13	11
8	300	36	12	14
9	300	30	10	5
10	300	28	9	5
SUM	**3000**	**392**	**13.1** *(average response rate)*	**113**

4.3 General Information

All participants were required to document personal information (e.g. their age, gender and household income). The purpose of these questions was to gain initial background information about each individual participant. In total, three incomplete questionnaires were returned regarding general information. These questionnaires were omitted and discarded from the study, as they did not satisfy the objectives of the study, as stated in Chapter 1, Section 1.4.

In order to interpret the findings, age was separated into the three broad social groups. It was the intention that each age group would reflect a different social group within society. It was perceived that this approach would be the most beneficial and practical for interpreting and analysing the data. The following social categories were chosen: young adults or students; and middle aged or retired, and the subsequent age ranges were chosen to reflect the individual groups: Under 25s, 25-65 and over 65s. The method of selecting specific social groups, as noted above, has been extensively applied across a wide range of research studies (Denscombe, 2014 & Miller and Salkind, 2002)**.** It therefore seemed logical to apply a similar approach in this study**.**

It was recognised, by separating age into different categories, there would be an uneven distribution between the three age categories and this had the potential to affect the sampled distribution. It was anticipated that ages below 25 would be underrepresented, for the following reasons:

- Under 25s are less likely to be homeowners; hence less likely to fill out a questionnaire delivered to the household.

- Typically, younger age ranges are underrepresented in any kind of voting poll (i.e. national election).

- On the whole, driving is a new experience for under 25s as they have recently passed their driving test. Therefore, individual's under 25 may be less willing to participate in a research study that aims to gain an insight into the barriers and practicalities that might exist towards promoting a greater usage of alternative forms of transport and a reduction in car use.

However, an advantage of this work being developed on a mixed methods approach was that any age group that was underrepresented, at this stage of the research, would have further opportunity to take part again in this study at a later stage. Table 4.2 highlights the age distribution of the sample population. Initial observations suggest that the age range of the sampled population was unevenly distributed. Table 4.2 indicates as the level of deprivation increases (i.e. becomes more deprived) the age of participants' decreases. This was anticipated, as it is typical to assume that more deprived areas have a lower mean age range compared to less deprived areas. Furthermore, it is typical that more deprived areas have a higher rate of mortality and health related problems, which might also distort the sampled age ranges that were achieved. This has been investigated and outlined further by Marmot and Bell (2012).

The majority of the sampled population were between the ages of 25 and 65 (57%). Participants below 25 and above 65 contributed 12% and 31% respectively to the overall research sample. The average age of males and females was 54 & 48 years, respectively. The overall age range of the sampled population was 51 years. This was above both the local and national average age ranges and this could reflect that the majority of the

questionnaires were gained from the least deprived areas, which typically have higher age ranges. The median age in the UK is 40 years, although this continues to increase and it is broadly accepted that the UK has an ageing population (ONS, 2015).

In order to determine the distribution of the sampled population, a test of normality was conducted using the Statistical Package for the Social Sciences (SPSS). The Kolmogorov-Smirnov test (K-S test) was selected as this was an objective method of determining the normality of the data, by comparing the sampled distribution of ages to a theoretical normal distribution. It was considered logical to use a KS-test as it is broadly acknowledged this statistical test is an attempt to determine if the collected dataset is different when compared against a normal distribution (Berk et al. 2014). Furthermore, it has been used extensively in transport studies (e.g. Love et al. 2014; Barthélemy and Toint. 2013 & Laurencas, et al. 2015). If the test achieved a significant value, this would indicate that the distribution of ages was significantly different to a normal (Gaussian) distribution and thus non-normally distributed. An overview of the distribution of ages sampled across all 10 deprivation levels can be seen in Table 4.3 and a further detailed distribution of all the sampled age ranges is shown in **Appendix 6**. The K-S test indicated that the overall age distribution was non-normal at the 99.9% confidence level. A KS statistic of .136 was achieved which indicated a significance value less than p=0.00.

An initial observation of the results clearly indicates that most deprivation levels were found to be non-normally distributed. This is illustrated further by the histograms, as detailed in **Appendix 6.** As a result, further research used nonparametric tests in order to determine if there was a significant relationship between urban demographic characteristics and travel attitudes and habits.

Furthermore, as highlighted above, a review of the mean values indicated that in the main, as the level of deprivation increases (i.e. becomes more deprived) the sampled age becomes younger. This was expected and has been found broadly throughout other research studies (e.g. Marmot & Bell, 2012; Atkinson and Kintrea, 2011 and Bradshaw, 2016). However, an anomaly to this rule of thumb is deprivation level 8. In total, deprivation level 10 had the fewest respondents and unsurprisingly indicated the lowest standard deviation (14.4). This therefore indicates there to be minimal variation between the ages

sampled in the deprivation level. The higher the standard deviation meant the greater in variation between ages that were sampled. Figure 4.1 compares the actual population (data gained from the Census, 2011) against the observed sampled population to further reinforce the uneven distribution of the sampled population.

Table 4.2: Response Gained by Age and Deprivation

Deprivation Level	Under 25	25 - 65	Over 65	Total
1	0	15	27	**42**
2	8	18	20	**46**
3	1	32	17	**50**
4	1	20	23	**44**
5	2	28	12	**42**
6	6	26	4	**36**
7	7	22	9	**38**
8	6	24	6	**36**
9	3	23	4	**30**
10	12	16	0	**28**
SUM	**46**	**224**	**122**	**392**

Table 4.3: Kolmogorov-Smirnov test (K-S test) on age distribution

Deprivation Level	K-S Test Statistic	Significance	Mean ages sampled	Std. Deviation
1	.189	<.001 (99.9% sig) non-normal	61.05	16.9
2	.189	<.001 (99.9% sig) non-normal	51.72	20.8
3	.145	.011 (99% sig) non-normal	53.56	14.6
4	.260	<.001 (99.9% sig) non-normal	56.77	18.9
5	.085	.200 (not sig)	53.52	17.3
6	.149	.043 (99% sig) non-normal	47.58	16.8
7	.166	.010 (99% sig) non-normal	47.58	18.1
8	.189	.002 (99% sig) non-normal	50.64	17.2
9	0.93	.200 (not sig)	45.10	15.2
10	.213	.002 (99% sig) non-normal	34.61	14.4
SUM	**.136**	**<.001 (99.9% sig) non-normal**	**51.10**	**18.2**

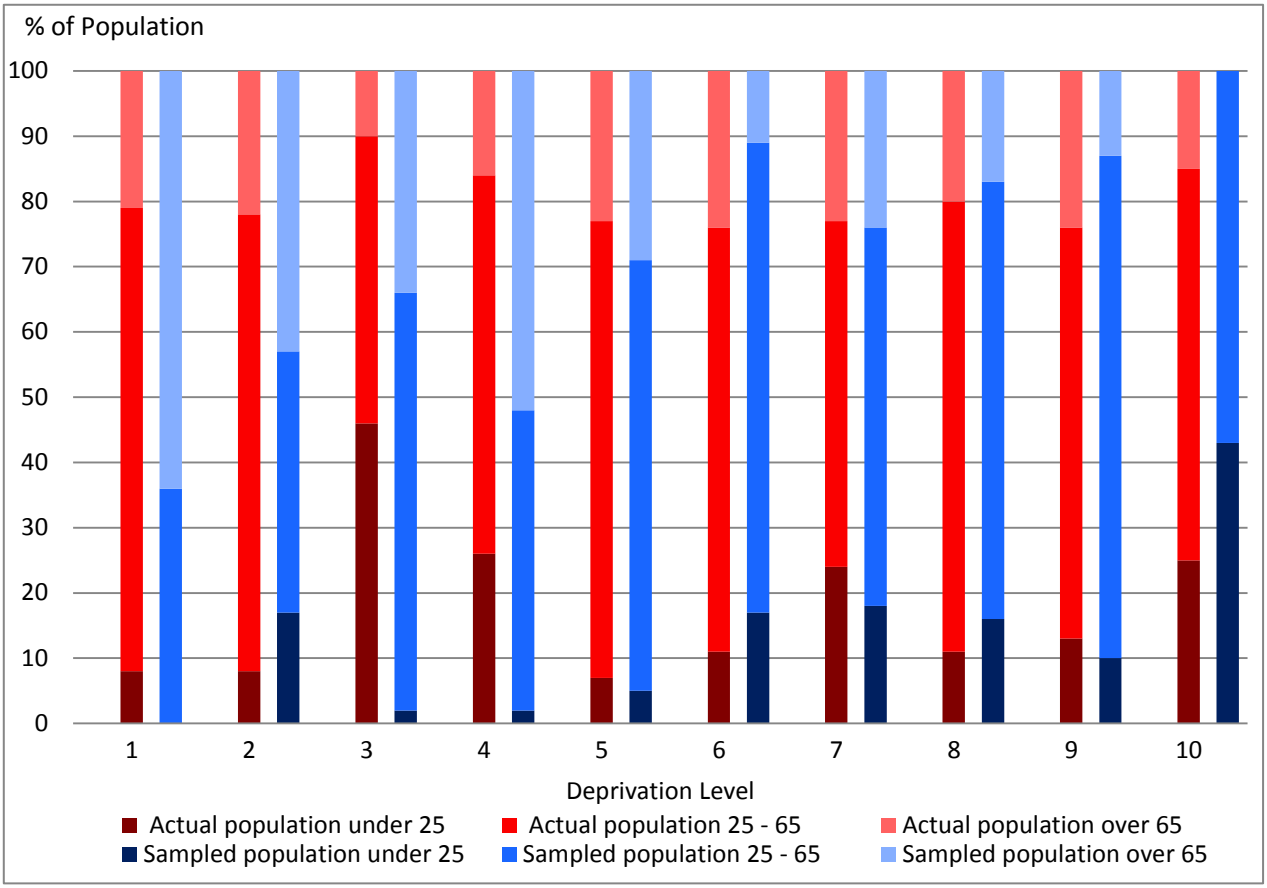

Figure 4.1: Actual Population Compared to Sampled Population

In total, 54% of the participants were male and 46% were female. Deprivation level 3 represented the greatest number of participants (50 participants) in comparison to deprivation level 10, which represented the fewest participants (28 participants). Table 4.3 provides a breakdown of responses by gender and deprivation. In addition, Table 4.3 could be used to inform and guide future research studies, transport planners or policymakers about the expected response rate of genders across different deprivation levels, and in turn, achieve **OBJECTIVE 1.**

Table 4.4: Questionnaire Respondents by Gender and Deprivation

Deprivation Level	Male	Male %	Female	Female %
1	30	14	12	7
2	26	12	20	11
3	27	13	23	13
4	16	8	28	16
5	24	11	18	10
6	12	6	24	13
7	13	6	25	14
8	25	12	11	6
9	19	9	11	6
10	20	9	8	4
SUM	**212**	**100**	**180**	**100**

4.3.1 Household Income

The participants were asked to state their household income (in pounds sterling) based upon a typical year (i.e. January to December). The response to household income was perceived to be gross income (i.e. before tax). Previous research has indicated that most people have a good awareness and understanding of their gross income compared to their net income (i.e. after tax deductions) (Kahneman et al. 2006). Furthermore, it is broadly recognised that, typically, often people round their income up to the nearest £10, £100 or £1,000 or state their income to be higher than what they actually receive (De Navas-Walt, 2010).

The purpose of collecting information regarding household income was to determine if the participants were a fair reflection of the wider population. Therefore, a question

concerning annual household income was deliberately asked rather than personal income as it was considered too intrusive and sensitive to ask participants to state personal financial information. This approach of investigating household income compares well with previous research, for example, Davis et al. (2014) who investigated the standard minimum income for the UK in 2014. However it was recognised that this questionnaire aimed to gain an insight into individuals' travel habits and attitudes and did not investigate household travel preference. Therefore, this was the only question throughout the questionnaire, which gained information about a household rather than information which related specially to an individual.

Further to the above, it is worthwhile considering that partners (who cohabit) might not disclose their incomes to each other; thus, it was assumed to be reasonable to not ask participants to state their precise income. In total, 7% of the questionnaire participants declined to provide their household income. This confirmed the sensitivity of the question. Participants who declined to provide information concerning household income were excluded from this section but not the overall research study, as it was not considered to impact on the findings of the broader research study.

Figure 4.2 provides an overview of household income by deprivation – values are based on the mean household income for each deprivation level. In order to conclude that the sampled population was a fair representation of the wider population (i.e. national population), the obtained and expected household incomes were compared. This was done by a desktop review of the data. Expected values were based upon the Census (2011). Overall, the data indicated that the sampled population was a fair reflection of household income across deprivation levels, in particular deprivation level 7. This was an important factor; as overall, it might suggest that the sampled population is an accurate representation of each deprivation area.

The pattern observed in Figure 4.2 seems to suggest that as the level of deprivation decreased household income increased. This emulated local and national trends. Deprivation level 10 indicated the greatest variation between the expected and obtained household incomes. This level received three questionnaires from participants who were unemployed. All three respondents indicated they had a household income below £15,000.

This begins to justify the fluctuation and variation shown in Figure 4.2. Thereby highlighting the potential limitation of using mean values to compare and contrast data. It is worthwhile highlighting that mean values can be affected by extreme values and volatility of a case study area.

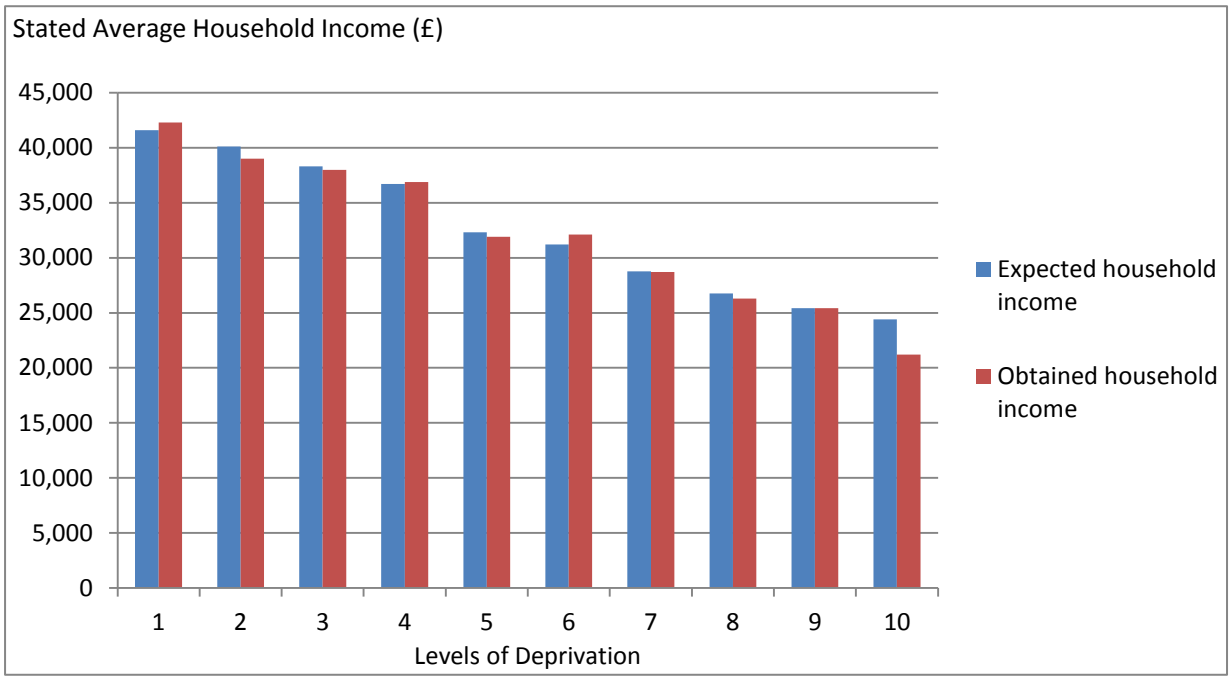

Figure 4.2: Expected and Obtained Household Income by Deprivation

4.3.2 Weekly Car Use

The participants were asked to state how often they used their car in a typical standard working week (i.e. Monday to Friday). They were asked to choose from five travel options, which ranged from every day to once a week. The purpose of the question was twofold: to explore how individuals used their car in a standard working week in order to determine the potential effect demographic characteristics might have towards individual's car attitudes; and to gain participants for future research. By asking participants, how often they typically used their car in a standard working week this aligned well with the definition of car dependency, as stated in Section 1.2 and justifies the design of this question.

It was critical that the sampled population had a strong car dependency (i.e. used it every day or every other day) in order to meet **OBJECTIVES 1 & 2** and to meet the definition of car dependency for this research study. This was because a main intention of this study

was to attempt to investigate FTS that might enable a reduction in car use, and in turn, promote and enhance a low carbon travel amongst individuals who were highly car dependent (refer further to Chapters 1, 2 and 3).

In total, 256 participants stated they used their car on a daily basis and a further 68 participants stated they used their car every other day. This illustrated that over 90% of the sampled population used their car at least every other day throughout a typical standard working week. The data reinforced how dependent the respondents were on their car for their daily travel use, regardless of different urban demographic characteristics, and confirmed that the sampled population was car dependent (based on the definition outlined in Chapter 1), achieving the intention of this research study. Table 4.5 indicates there to be limited variation when comparing deprivation areas and car use. However, the findings of this work contrast with previous research studies that suggest a strong relationship between car use and deprivation levels (e.g. National Transport Survey (NTS), 2013 & Goodwin & Dender, 2013). However, it should be considered that this research study focused on individuals who were highly car dependent and therefore it was anticipated that the sampled population would be highly car dependent, and thus these results are unsurprising and might not be a true representation of travel habits and attitudes for each deprivation level. However, the findings of this work are representative of some individuals across different deprivation levels who are considered the most the car dependent along a selected travel corridor in Birmingham, UK.

Furthermore, the data seems to suggest there to be limited variation between distance (e.g. from an urban location) and car use. For the purpose of this research study the surveyed deprived levels were typically located towards urban areas. Assuming the above parameters, the participants who lived in more deprived areas might have wider access to a greater level of amenities that were within a walkable or cycleable distance, and therefore may have been likely to be car dependent. Although there was no variation between deprivation levels, distance and car use was observed within the data. The data began to reconfirm the importance of adopting a broad approach in order to inform new transport strategies. This reinforces the need for transport planners to not take an umbrella approach towards implementing FTS. It should be considered that deprived areas are also located in rural or remote areas. This is not highlighted in this research study and might be a

limitation of conducting a case study based research study. On the other hand, this work focused on urban areas as it was considered there were more related transport related problems compared to rural areas, for example in the countryside. Refer further to Chapter 3, Section 3.5 for an in-depth discussion concerning the influence of a case study approach.

Table 4.5: Compares Weekly Car Use across Different Levels of Deprivation (shown as percentage)

Deprivation Level	Everyday	Every other day	Twice a week	Once a week	Other	Total
1	86	14	0	0	0	**100**
2	52	17	13	9	9	**100**
3	74	18	4	2	2	**100**
4	52	30	18	0	0	**100**
5	40	36	24	0	0	**100**
6	78	10	6	0	6	**100**
7	53	18	11	13	5	**100**
8	61	17	17	0	5	**100**
9	83	0	0	0	17	**100**
10	86	0	0	14	0	**100**
SUM of Participants	**256**	**68**	**38**	**14**	**16**	**392**

4.3.3 Preferred Method of Transport

The participants were asked to state their preferred method of transportation (e.g. by car, walking or train) in order to determine their preferred modal choice. In total, 86% of the participants stated that the car was their preferred method of transportation. The remaining 14% of participants stated that they preferred alternative forms of transport, such as the train or bus. In total, 2% of participants preferred walking or cycling. This concurred well with national and local Census data (2011) and suggested the sampled participants were a fair representation of wider society. It was unsurprising that the participants seemed to favour a preference to the car for their daily travel needs. This is because the car is broadly acknowledged as the preferred method of transport throughout most developed societies. This is despite extensive transport strategies that have sought to promote and encourage a reduction in car use, influence travel attitudes, or enhance environmental behaviour (refer to Chapter 2 sections 2.4 and 2.5 for a more detailed discussion).

However, despite what appeared to be a preference towards the car, two thirds of the participants accepted that their car use contributed to environmental problems, such as climate change or high levels of air population. This seemed to indicate an acceptance amongst participants that their actions contributed towards climate change. Furthermore, this confirmed previous research by the King Review (HM Treasury, 2007) that suggested there to be a gap between individuals' understanding of environmental problems and their actions. This might suggest that the data collected for this research study reflects a representation of environmental views, or that in our current society, for most people there is no satisfactory alternative modal choice of which has the supporting infrastructure, legislation or overall willingness to encourage a change in individuals travel attitudes. This therefore indicates further research is required to investigate how to develop new sustainable transport planning strategies, which in turn might influence different groups of individuals' attitudes and acceptance to use alternatives forms of transport – achieving **OBJECTIVES 3, 4 & 5.**

4.3.4 The Association of Health and Car Use

The first section of the questionnaire concluded with a question concerning health. A wide range of research studies have shown there to be a significant association between health and individuals travel attitudes (Rojas-Rueda et al., 2011). Therefore, it was deemed critical to explore the health of the sampled population, as health could have an influence on the research findings, in particular towards individuals travel preference.

For example, if some participants felt that their health acted as a barrier, stopping them from using alternative forms of transport, it is unlikely they would consider favouring or supporting transport strategies that attempted to reduce their car use. In total, 7% of the participants stated health had or was currently affecting their travel attitudes. Of those participants, 3% were registered disabled. Consequently, 90% of the sampled population considered themselves as physically able or active to consider using alternative forms of transport.

4.4 Your Travel Habits

The intentions of section two were twofold. Firstly, to determine how individual's travel attitudes might change over a given time period, and secondly, to determine future transport strategies or incentives that might enable a reduction in an individual's car use. It was the intention this would inform FTS and in turn, achieve **OBJECTIVES 4 & 5**.

4.4.1 Dependency of Car Use

The participants were initially asked to indicate how dependent they were on their car for their daily travel needs. Dependency was ranked on a ten-point scale from 1 to 10. A score of 1 indicated that the participant had a very weak car dependency, whereas a score of 10 indicated they had a very strong car dependency. Figure 4.3 compares how individuals scored their car dependency compared to age. Figure 4.3 suggests there to be an association between age and car usage. Initial observations from the data show that 97% of participants who were over the age of 65 indicated they had a car dependency of 7 or above, compared to 65% of participants under the age of 25 who indicated their car dependency was either equal to or below 5.

A Spearman's Rank test was conducted to determine the statistical relationship between car dependency and age. This test was chosen as it is broadly used throughout research studies to investigate the negative or positive relationship between two variables (e.g. Dongli et al. 2014 and Liu & Shao, 2014). Furthermore, it is a nonparametric test, which measures the level of correlation between different variables. To reaffirm, nonparametric tests were required as the data obtained for the purpose of this research study was identified to be non-normally distributed (see section 4.3) and Appendix 6.

The results indicated a moderate positive relationship between age and car dependency that is highly significant (0.45, $p=<0.001$). The data can therefore be accepted at the 99.9% confidence level to indicate that there is a positive correlation between age and car dependency (e.g. older individuals are more dependent on their car for transportation). This data concurred well with previous research that indicated older individuals are typically more reliant upon their car (e.g. Davey, 2007).

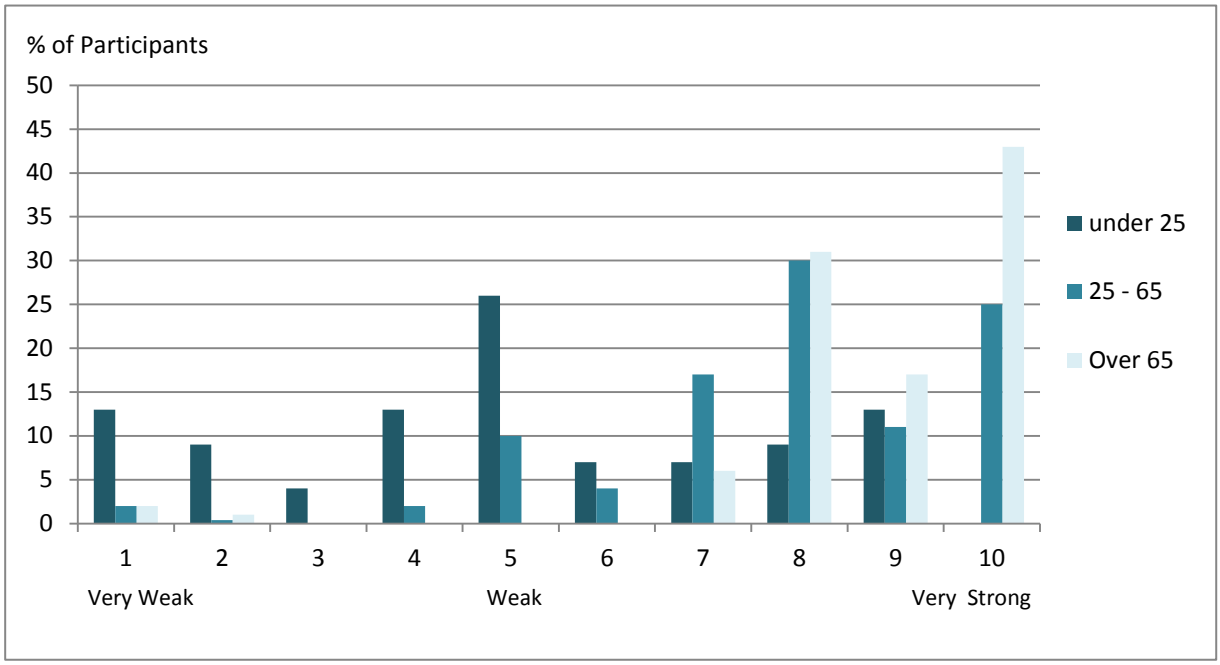

Figure 4.3: Car Dependency Compared to Age

4.4.2 Potential to Reduce Car Use

The participants were then asked to state how easily they could potentially reduce their current car use (based upon the current UK highway network). They were asked to rate their score on a ten-point scale. A score of 1 indicated they could easily reduce their car use, and a score of 10 suggested they would never reduce their car use. It was critical to establish the individual's potential willingness to reduce their car use in order to inform future transport planning strategies and to compare the influence demographic characteristics have towards individual's travel attitudes – achieving **OBJECTIVE 1.**

Figure 4.4 compares how age might affect an individual's ability to reduce their car use. Overwhelmingly, Figure 4.4 indicates there to be a strong association between age and car use. A Spearman's Rank test was conducted between age and car use. The findings indicated a highly significant relationship between age and car use ($p<0.001$) at the 99.9% confidence level. Therefore, Figure 4.4 indicates as the age of an individual increases, the likelihood of their willingness to reduce their car use decreases. For example, 93% of participants under 25 scored their ability to reduce their car use as 5 or less, compared with 76% of participants over the age of 65 who scored their ability to reduce their car use 7 or more. Two broad limitations were associated and observed with the data collected to inform Figures 4.3 and 4.4:

1. The uneven distribution and under-representation of age ranges (i.e. under 25 year olds). However, responses gained from the under 25s were similar. This advocated that even if a greater number of surveys were returned from participants who were under the age of 25, this would have not affected the findings. For example, 93% of the participants who were under the age of 25 indicated that they could either easily or extremely easily reduce their car use.

2. The questionnaire did not ask participants to directly justify their responses. It was anticipated that additional research methods (e.g. travel diaries and interviews) would begin to determine and gain an insight into why age seemingly impacted car use so dramatically, and to investigate triggers that would reduce an individual's car use. Thus to promote and encourage FTS which have individual's willingness and acceptance to reduce their car use – achieving **OBJECTIVES 4 & 5.**

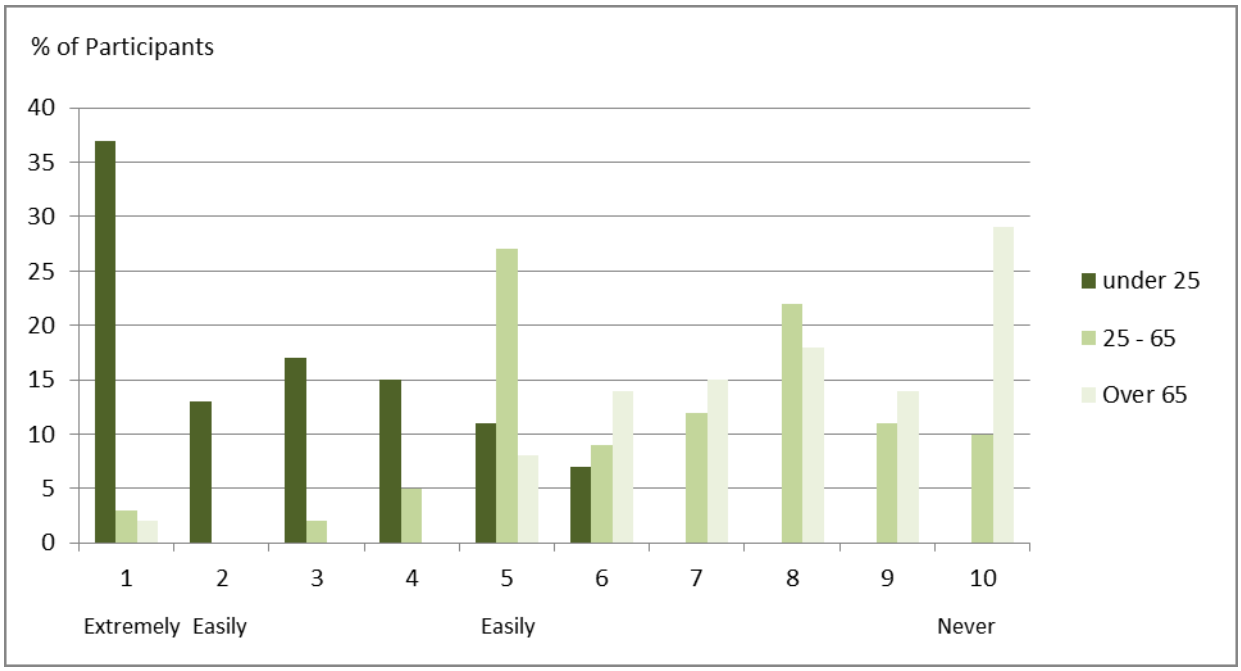

Figure 4.4: Respondents Ability to Reduce their Car Use by Age

4.4.3 Predicted Future Car Use

The participants were asked to indicate how their car use would change over a 15 year period. It was assumed there would be no change to the current road infrastructure. A 15 year time period was chosen, as it was considered more realistic, conceivable and imaginable than a greater time period, for example, 30 years. Three time periods were considered worthwhile to investigate: 5, 10 and 15 years' from now. The participants used a ten-point scale to indicate how their car use might change. A score of 1 indicated participants predicted their car use to decrease dramatically where a score of ten suggested participants predicted that their car use would increase dramatically. Figure 4.5 indicated that in the short term (i.e. within 5 years' time from now) there seems to be a minimal increase in car use. However, over a greater time period (i.e. in 15 years' time from now) the data encouragingly suggests individuals predicted their car use to reduce. For example, 63% of the participants suggested that they predicted their car use to decrease in 15 years' time. Justifications for this included:

- Predicted increase in age would result in a decrease in mobility.

- As rise in technology (for example internet shopping) would reduce car dependency.

Interestingly, despite the impacts of excessive car use being well documented, acknowledged and broadly accepted to be a significant contributor towards environmental impacts (e.g. throughout online or printed media), no participant suggested their car use would decrease because of environmental considerations, such as concerns about global warming and sea level rises. On the other hand, Figure 4.5 suggests individuals seemed to indicate a willingness to reduce their car use. This confirms previous research by Lane (2011) who suggested 81% of the population wanted to shift their modal usage towards alternative forms of transport.

It therefore may be reasonable to suggest that current transport strategies that attempt to promote a greater usage of alternative forms of transport are not meeting the needs and requirements of different groups of individual's. Transport studies indicate, typically, throughout most areas of the UK there appears to be a low uptake to alternative

forms of transport (this is reiterated in Chapter 2 sections 2.2 and 2.6). The findings from Figures 4.4 & 4.5 and previous research studies (discussed in this chapter) appear to suggest there to be willingness amongst individuals to be prepared to reduce their car use. Henceforth, this suggests that a new nexus of planning strategies needs to be conceptualised in order to exploit those individuals who have a willingness to reduce their car use.

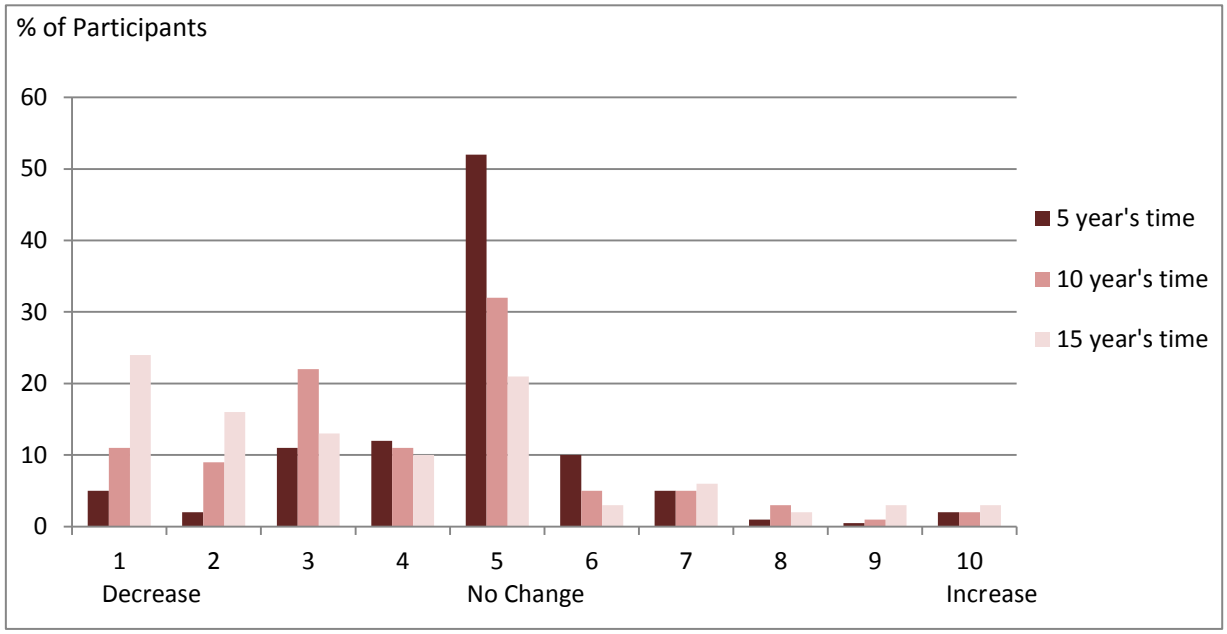

Figure 4.5: A Comparison of Individuals Predicted Car Use over Time

4.4.4 Travel Factors to Influence an Individual's Car Use

In order to achieve **OBJECTIVES 3 & 4**, the participants were asked to disseminate travel factors that they perceived influenced their car use the most. This helped to formulate an insight into why individuals seemed to have a strong affiliation to the car. The participants were given no guidance or information concerning potential travel factors, as the study did not want to manipulate their responses. Table 4.6 compares key travel factors that were highlighted to have the greatest impact on individual's car use. Table 4.6 indicates key travel factors to influence car use based upon different demographic characteristics. The sampled participants gave a range of responses and these were grouped into the following key travel factors: family commitments (e.g. taking and collecting children from school or collecting elderly relatives), employment and flexibility and convenience (refer

further to Table 4.6). These key travel factors were chosen based upon travel survey data collected by the National Travel Survey (NTS) (2014).

Table 4.6 emphasises the importance to tailor future transport planning strategies based upon specific urban demographics – particularly focusing on different deprivation areas and age. Different groups of demographic characteristics indicated that different travel factors affected their car use. For example, health (highlighted in ***bold italics***) is only depicted to influence travel attitudes of those participants who were above 65 years of age and living in deprivation levels 1 – 3; hence they are highlighted in bold. These findings have similarities to previous research by Rubenstein (2006) and Khan et al. (2014). This begins to suggest there is no one solution towards developing future transport planning strategies. On the other hand, some similarities can be observed from Table 4.6. For example, flexibility and convenience seem to affect all but three demographic groups, which were sampled for the purpose of this work. Therefore, some strategies would potentially provide benefits and could be implemented in a broad range of travel stakeholders.

However, based on the initial findings for this research study it is suggested that if transport stakeholders are going to make a real difference, it is imperative that future transport planning strategies are conceived based upon a bottom up approach, rather than a top down approach, in order to meet individual's travel requirements and needs. This concurs well with previous research by Greed (2011). In addition, Table 4.6 is a starting point for transport planners and local authority members as a guide to inform them of key travel factors that are most likely to influence an individual's car use across the different demographic characteristics that have been identified in this study.

Table 4.6: Comparison of the Top Three Stated Travel Factors to Increase Individuals Car Use by Different Demographic Groups

	Urban demographics							
	Deprivation			**Age**			**Gender**	
	1-3	**4-7**	**8-10**	**Under 25**	**25 – 65**	**Over 65**	**Male**	**Female**
First highest stated factor	Flexibility/ Convenience	Flexibility/ Convenience	Family Commitments	Employment	Flexibility/ Convenience	Flexibility/ Convenience	Flexibility/ Convenience	Flexibility/ Convenience
Second highest stated factor	Employment/Public transport inadequate/ expensive or unreliable	Public transport inadequate/ expensive or unreliable	Public transport inadequate/ expensive or unreliable	Public transport inadequate/ expensive or unreliable	Public transport inadequate/ expensive or unreliable	Public transport inadequate/ expensive or unreliable	Public transport inadequate/ expensive or unreliable	Public transport inadequate/ expensive or unreliable
Third highest stated factor	Family Commitments/***Health***	Employment	Employment	Family Commitments/ Cost of Driving	Employment	***Health***	Employment	Employment

4.4.5 Social Inequalities and Car Use

It has been suggested by previous research studies that social inequalities such as wealth can influence individuals mobility choices (for example, Bocarejo S and Oviedo H, 2012). It was therefore deemed critical to determine the potential influence age or wealth might have on individual travel attitudes to achieve **OBJECTIVE 3**. The participants were asked to state if either age or wealth had previously impacted their car use and additional space was provided to allow participants to elaborate further if they felt it was necessary. Participants who indicated that age impacted their car use, because they were once too young (e.g. below the legal driving age) were excluded from this section of the research. This was because the legal driving age affects everyone. Currently in the UK the legal driving age is 17 years of age. This was considered as an unaccepted response, as this once affect everyone. Accepted responses were responses that were logical and unique to that participant and not responses that would have affected everyone, e.g. the legal driving age.

"I feel too old drive" **(Participant 247).**

"When I started driving I felt terrified, really worried because I had never done it before. Now I just get in the car and don't think twice about driving… I think practice over time really helps which you only get with age" **(Participants 387).**

The examples of responses gained are discussed below. Of the 392 participants questioned, 43% stated age had once been a barrier stopping them from driving, or had manipulated their car use attitude and behaviour, compared to 12% of participants who said wealth had once impeded their car use. This reinforces the influence age has on car usage, as it seemed to have a greater ability to manipulate individuals' car use over wealth. Typical responses highlighted travel factors such as: cost, lifestyle, family commitments. Refer to examples below.

"I can't afford to drive!! I want to save as much money as I can to pay off my student loan" **(Participant 15 - Under 25).**

Or

"I'm a student and have the flexibility to travel when I want and I don't need a car at uni anyway… however I think this might change later on in life" **(Participant 217 - Under 25).**

Or

"I have a young family! Public transport is not accessible to commute with children. I feel much safer in my car!!!" **(Participant 103 - 25 - 65 years of age).**

The findings began to reconfirm how different demographic characteristics affect individual's car use. This concurred well with research by Banister (2008). Furthermore, the findings identified how an individual's travel needs can change over time. For example, participants under the age of 25 appeared to imply that the cost of driving was a major factor, whereas family commitments seemingly became more prevalent as age increased. This research could be used to inform local authorities or transport planners of future transport planning strategies of travel triggers that might promote a reduction in car use, achieving **OBJECTIVE 5**.

4.4.6 Future Incentives to Reduce Car Use

Section two of the questionnaire concluded by asking participants to list or highlight potential future transport incentives that could be developed that would encourage them to reduce their car use. No guidance was given, in order to not manipulate responses and the participants could discuss as many incentives as they wished. Henceforth, the number of incentives gained varied from participant to participant. In total, five potential transport incentives were highlighted to have the greatest gravitas. This section was considered particularly important to the study as it was considered the participants were given the freedom to document in their own words travel incentives that might reduce their car use. The most popular incentives were then taken forward into the interview discussions.

The majority of the participants (32%) indicated cheaper public transport would be the most influential strategy to reduce their car use. This was closely followed by 27% of participants who stated accessibility and the number of services needed to be improved to encourage a reduction in car use and increased in reliability, cleaner and or safer public transport. In total, 12% of participants stated other incentives would reduce their car use, suggesting incentives such as increased vehicle taxation or a personal daily mileage allowance. The participants were not asked to justify their responses. Additional research (e.g. travel diaries and interviews) would begin to explore and investigate justifications for the strategies or incentives that were shown (throughout the questionnaire) to influence individuals car use**.**

Furthermore, it is worthwhile highlighting that Figure 4.6 and Table 4.7 (below) were based on two separate questions within the survey. However, it was the intention that both questions would complement one another. Figure 4.6 asked the participants to list incentives that might reduce their car use. This was in comparison to Table 4.7, which identified eighteen hypothetical FTS for participants to respond on a five-point scale. The findings were used to understand how different strategies might influence different groups of individuals.

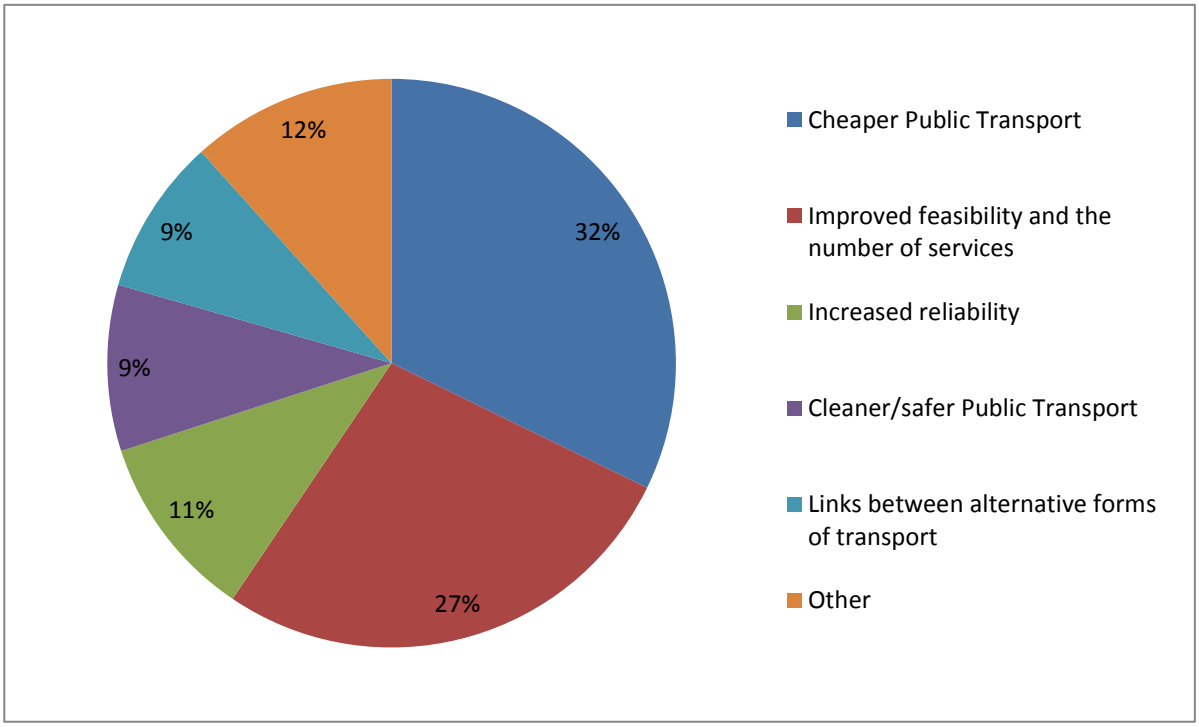

Figure 4.6: Future Travel Incentives to Reduce Car Use

4.5 Future Transport Strategies

The penultimate section of this questionnaire explored the influence of eighteen hypothetical FTS in order to determine the effect that they might have towards an individual's travel attitudes (refer to Table 4.7). In the main, there are four measurement scales used in statistics that are separated into two main classes: categorical and continuous data. Categorical data can be separated into nominal or ordinal classifications. Nominal data has no categorical order, such as comparing male or female, while ordinal data is categorised and has an order; for example, car use dependency on a scale from 1 - 5 or age. This contrasts with continuous data, which can be separated by either interval or ratio scales. Interval data is where data has an arbitrary scale; in other words, no absolute zero, for example, temperature while a ratio scale is continuous data and has an absolute zero. For the purpose of the research, data was used on an ordinal scale as the data was categorised into a logical order on a five point scale. A score of one suggested that the sampled participant would drive a lot less while a score of five represented someone who would drive a lot more.

Table 4.7 identifies the FTS that were found in the research to have the greatest impact to reduce an individual's car use. It was the intention this would inform transport knowledge and debate and inform planners and policymakers of how FTS might influence car use in the future.

Mean values were calculated to compare the association between FTS and demographic characteristics. It is broadly considered that mean values provide an accurate description of the entire data (Gorard, 2013). In addition, mean values have been used throughout previous studies. For example, Pooley et al. (2013) used mean values to investigate how to promote walking and cycling policies from a street perspective in England. Table 4.6 reflects the FTS that had the greatest to least impact on an individual's car use. The top three FTS that were shown to have the greatest effect towards reducing an individual's car use were:

1) Public transport fares decreased by 25% (2.1 average score indicates individuals would tend to drive less under this strategy).

2) Congestion charge (similar to that of a London style congestion charge) was implemented at £5 per day, but cycle lanes and public transport facilities were commonly available (2.2 average score indicates individuals would tend to drive less under this strategy).

3) No change to your commuting distance but public transport and cycle lanes were commonly available (2.3 average score indicates individuals would tend to drive less under this strategy).

The above three strategies were chosen as there appeared to be the greatest difference between them and the other hypothetical transport strategies. The top three strategies seemed to reconfirm that individuals were willing to use alternative forms of transport. For example, the fourth and fifth strategies (noted in Table 4.7 as strategy 11 and 18 respectively) both gained an average score of 2.7 in relation to car reduction. Furthermore, the three FTS identified seems to complement well the previous findings of this study (e.g. Figure 4.5); for example, the strategy to have the greatest effect was to reduce public

transport cost. This corresponded well with the findings from Figure 4.6, which also indicated price influenced individual's car use attitudes and behaviour.

A chi-squared test was performed to test the statistical relationship between demographic characteristics and each transport strategy. A chi-squared test is considered a robust statistical test to interpret categorical data taken from questionnaires (Pesudovs, et al. 2007; Kitchener, et al. 2015).

The aim was to determine which demographic characteristics had a significant influence on travel attitudes and behaviours and in turn, to inform FTS from the perspective of those individuals who are highly car dependent, achieving **OBJECTIVES 1, 3, 4 and 5**. A chi-square statistic with a significance value above the 95% confidence level would indicate there was a significant relationship between the demographic characteristics (e.g. age, gender and deprivation) and travel attitude and behaviour (i.e. a reduction in car use).

The following *p-values* were observed: $p = 0.018$ (age); $p = 0.339$ (levels of deprivation) and; $p = 0.522$ (gender). The results confirm previous data suggesting age is the most influential urban demographic (e.g. Lyons and Urry, 2005; De Groot and Steg, 2006; Prillwitz et al. 2006 and Fishman et al. 2014). Furthermore, the data from the questionnaire appears to indicate that when transport stakeholders develop FTS, greater attention or consideration should be paid to age instead of other urban demographic characteristics, such as deprivation or gender. However, it was acknowledged that previous research has indicated that gender and deprivation impact car use (e.g. Polk, 2004; Newman, 2006; Rajé, 2003). This was one of the most significant and contrasting findings from this questionnaire. Furthermore it provides further justification and significance for conducting a mixed methods approach, which attempted to gain a holistic perspective of travel attitudes in order to validate the research findings.

Table 4.7 Future Transport Strategies to have the Greatest Stated Impact Towards Reducing Individuals Car Use

Future Transport Scenarios (FTS)	Overall mean value	Rank order
12.Public transport fares decreased by 25%	2.1 I would drive less	**1 (Greatest car reduction)**
2.Congestion charge implemented at £5 per day but cycle lanes and public transport facilities were commonly available	2.2 I would drive less	2
4.No change to your commuting distance but public transport and cycle lanes were commonly available	2.3 I would drive less	3
11.A weeks free trial was available to use public transport or hire a bicycle	2.7 No change	4
18.Supermarket shopping was discounted by 5% if you used the home delivery service	2.7 No change	4
6.Elevated cycle lanes were commonly available	2.8 No change	6
10.Fuel increased by 10p per litre for the next 3 years	2.8 No change	6
13.Cycle parking was commonly available	2.9 No change	8
14.Automobiles were limited to 20mph for 3 years	2.9 No change	8
15.On road cycle lanes were commonly available	2.9 No change	8
17.Your working hours were flexible	2.9 No change	8
3.Compulsory for all employers to provide shower and changing facilitates	3.0 No change	12
16.Your commuting time increased by 30 minutes but cycle lanes and public transport facilities were widely available	3.0 No change	12
5.All cycle lanes/ parking removed	3.3 No change	14
7.Road tax increased by an additional £5 for the next three years	3.3 No change	14
1.No change to urban road structure	4.0 I would drive more	**16 (least car reduction)**
8.No obligation for employers to provide shower/changing facilities	4.0 I would drive more	**16 (least car reduction)**
9.Congestion charging scrapped after 3 years with no improvements to public transport or cycle lanes	4.0 I would drive more	**16 (least car reduction)**

4.6 Chapter Conclusions

The main intentions of the questionnaire were to gain an insight into the travel preferences of individuals across three distinct demographic characteristics and to seek out participants for further research (travel diaries and interviews). This chapter has acknowledged that the questionnaire did not initially specifically target individuals. In contrast, the survey initially targeted households in order to drill down into the travel attitudes and habits of an individual within a selected household along a selected travel corridor. All participants were required to hold a full UK driving licence. It was the intention that future research (e.g. travel diaries and interviews) would begin to specifically target those individuals who were considered to be the most car dependent participants from the questionnaire sample. However, despite the questionnaire not specifically targeting those car users who were considered to be the most car dependent, the majority of participants who took part in the survey were considered to be car dependent (*n=324*).

Encouragingly, the questionnaire achieved responses from all ten deprivation areas and a well-balanced gender response was achieved. This provided a broad range of responses and further opportunity for future research (e.g. travel diaries and interviews) to gain and develop a detailed insight into travel preferences across a wide range of people, achieving **OBJECTIVES 1, 2 & 3.** On the other hand, a potential limitation was that most participants were between the ages of 25 – 65 and fewer responses were gained from more deprived areas. Therefore a non-normal distribution was observed and thus the findings from the questionnaire might contain a level of bias. However, this provides further justification and reveals the benefit of conducting a mixed methods approach.

Overall, the findings from the questionnaire concurred well with previous research studies, as similarities were observed. However, contrasting findings were found when compared to previous transport studies. For example, there was no observed association between car use and distance, although it should be acknowledged that most participants sampled were car dependent. Age was considered the most significant influential demographic factor. Therefore, if transport planners and policymakers want to make the

greatest impact on reducing car use they should focus and tailor travel strategies towards age.

Finally, some encouraging findings were unearthed that suggested some individuals might be prepared to change their travel habits towards preferring alternative forms of transport. The data indicated that some of the most car dependent individuals who were sampled might be willing to reduce their car use. However, current transport strategies appear to be failing to meet their travel demands and needs as the sampled population indicated a preference towards the car for their daily travel. It is unclear from this work if the same willingness to reduce car use will be shown across other areas of the UK, and this presents a useful avenue for further research. Chapter 5 continues to discuss the findings of this research study based on the travel diaries and interview findings.

Chapter 5

Chapter 5: Results and Analysis: Travel Diaries and Interviews

5.1 Introduction

This chapter provides a detailed discussion of the results collected for the travel diaries and interviews. This chapter is separated into two main sections: Travel diaries and Interviews. Both methods are analysed in this chapter as they were conducted directly after each other during the same period. It therefore seemed logical to analyse the results in once concise chapter.

The travel diaries aimed to gain an insight into an individual's weekly car use in order to determine how personal circumstances could affect an individual's travel patterns. In turn, to gain an understanding of their travel habits and attitudes in order to inform future interview discussions between transport users (e.g. selected participants) and experts (e.g. consultants, policymakers).

The travel diaries gained a useful insight into the sampled population's standard weekly car trips and provided a useful starting point for the follow up interviews. The findings from the questionnaire when then used to inform the interview discussion.

5.2 Travel Diary: General Overview

A total of eighteen participants completed a weekly travel diary. It seemed logical to split deprivation into three distinct groups (1-3, 4-7 and 8-10) to reflect different socio-economic groups (e.g. lower, middle and upper class). Therefore a broad range of travel opinions across different deprivation levels were gained; in turn achieving **OBJECTIVES 1 & 2**, and allowing for a broad range of travel attitudes and habits to be explore, in turn achieving **OBJECTIVES 1 & 2**.

All participants were asked to complete their travel diaries for seven consecutive days (i.e. Monday to Sunday), documenting all of their car trips. The diaries were split into two sections: your details (i.e. name, post code, make, model and engine size of car, etc.); and your travel diary (e.g. description of your car trip, start and finish time of a given trip, approximation of trip length and perceived trip cost). It is worthwhile to note that the participants were not required to complete their travel diaries throughout the same week or

month. In contrast, all participants were required to complete their travel diaries within a specific period, returning the travel diaries by the end of March 2015. This approach was considered less intrusive as it gave the participants the opportunity to document their travel at their convenience (refer further to Chapter 3, Section 3.7 for further detailed discussion and justification).

The participants were only invited to take part in further research if they had indicated throughout the questionnaire survey that they had a strong car dependency (i.e. they drove every day or every other day). It was considered beneficial and practical to only invite participants who had identified they had a strong affiliation to the car in order to satisfy the purpose of this study (refer to Chapter 1).

5.2.1 Participants Travel Patterns

All eighteen participants were asked to provide a justification or state the purpose of their personal car trips. On the whole, the participants indicated that they predominantly used their car for the following purposes: employment; leisure (shopping or visiting the gym); family commitments; or other travel purposes (e.g. visiting a doctor, dentist or college/school). This concurred well with previous research (e.g. Chun-Chu and Petrick, 2016; Molloy, 2017 and De Vos, 2015) and in turn suggested that the sampled respondents were a fair reflection of wider travel attitudes and habits.

Figure 5.1 indicates that different age groups had dissimilar travel patterns. For example, employment trips were only pertinent to those individuals aged below 65. No participants over the age of 65 indicated that employment was a justification for using their car. It was expected that different travel patterns would be associated with different age groups; for example, participants who were employed or retired, as it is reasonable to assume different age groups engage in different activities. For example, many individuals (in the UK) retire by the age of 65, although this is not a given, and there is no legal retirement age in the UK. In addition, external factors that might influence travel patterns should be considered. For example, Choo and Mokhtarian (2004) suggest travel patterns are related to the types of vehicles individuals own (e.g. 4X4, SUV's or sports car).

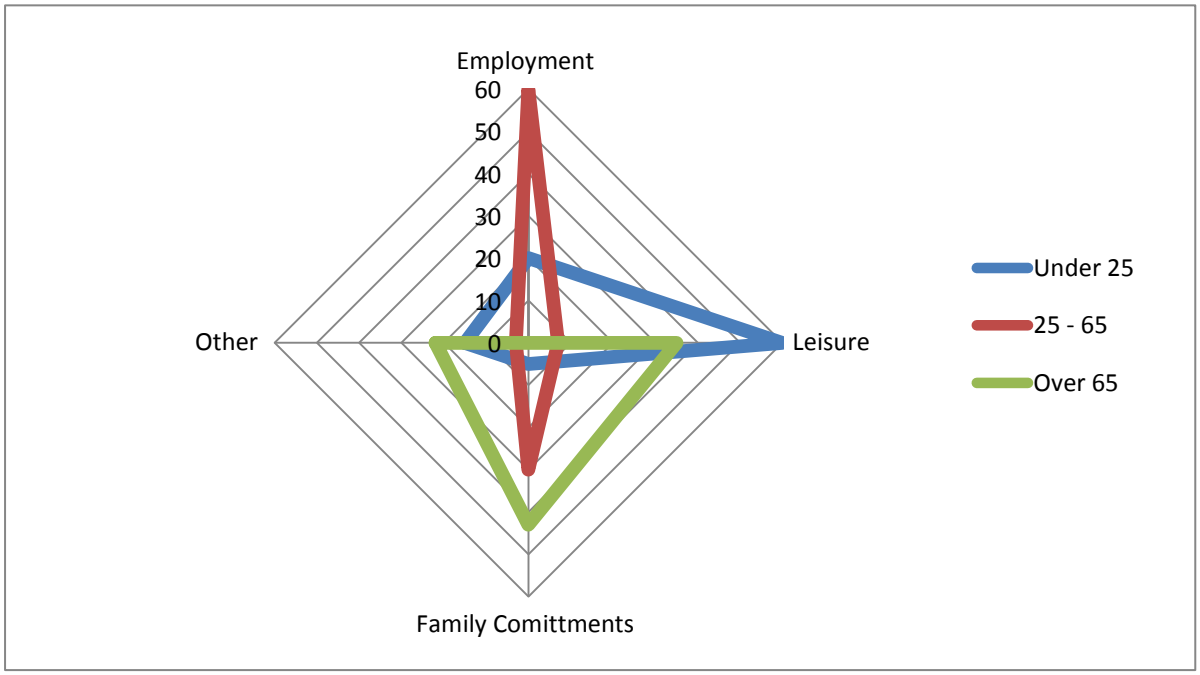

Figure 5.1: Trip Purpose by Age (shown as percentage)

This study identified that most of the car trips taken by the participants were feasible by alternative forms of transport, however, overall the participants preferred to drive rather than walk, cycle or use public transport. It is acknowledged that the term feasibility is widely discussed throughout research studies, but often lacks clarity (Falcocchio and Levinson, 2015). All participants were informed of the meaning of feasibility for the purpose of this research. Indicators of feasibility for different modes of travel are each outlined in turn below:

- ***Walking*** – A trip that does not exceed 1.5 miles. Most research studies have suggested a distance of between 0.25 – 1.5 miles is an acceptable walking distance for the majority of people who are physical able and less acceptable for individuals who are less mobile, for example, the elderly or disabled (e.g. Yang and Diez-Roux, 2012; Nasuti et al., 2013; Park et al., 2014).

- ***Bus & Train –*** Services that operate every ten minutes (minimum) and that are located within a 10-minute walking radius of their home. This was based

upon the research by Guo et al (2015); Cheng and Tsai (2014); Durrande-Moreau and Usunier (1999).

- ***Cycling –*** A distance that does not exceed 3 miles or approximately a 10-minute cycle ride. This was based upon the findings of Wuerzer and Mason (2015) and Pooley et al. (2011a).

In total, 64% of car trips (*n=104*) were considered to be within a feasible distance to use alternative forms transport when based upon the above definitions and Figure 5.2. This concurred well with the results of the questionnaire survey, which found most individuals had a preference towards their car. Figure 5.2 indicates the percentage of car trips that were potentially feasible by alternative forms of transport. The data indicates that over 64% of car trips (taken by the sampled participants) were potentially feasible by either a train or bus. This compared to 27% *(n= 44)* of all trips that were feasible by walking, and the findings from this work indicated that nearly a third the sampled trips were less than 1.5 miles. Although, a number of potential avenues still remained unanswered and provided opportunities for further research, for example:

1) Do journey planners take account of factors such as congestion when advising on transport choices?
2) How does the perception of congestion impact travel choices, for example by car or alternative forms of transport?

It was the intention of the interview discussions to begin to investigate some of the barriers and constraints, which might prevent some individuals from wanting to use alternative forms of transport, and preferring to use their car.

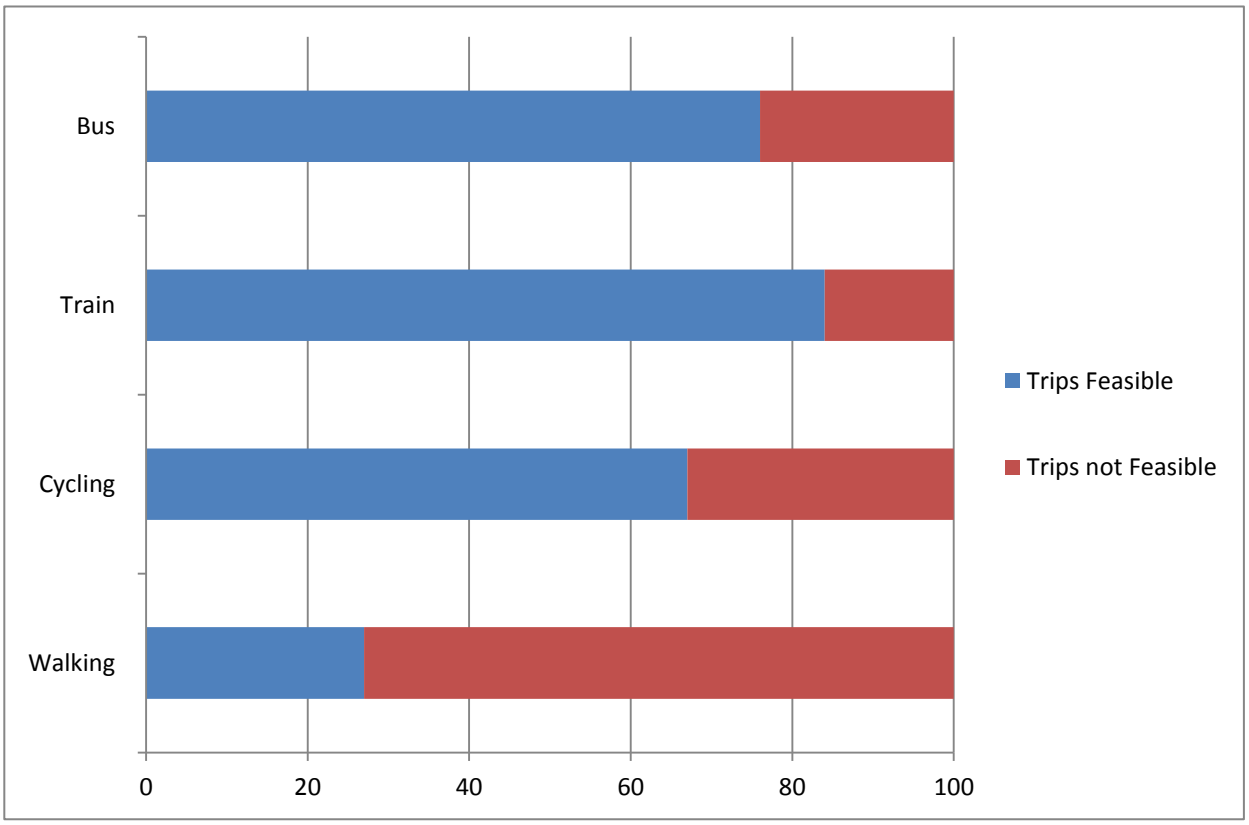

Figure 5.2: Percentage of Car Trips Feasible by Alternative Forms of Transport

It is also worthwhile to suggest some trips are more suitable to different modes of transport. For example, some participants indicated that the car was not always a practical or viable option. For example, Participant 2 stated they preferred to travel by the car when they were shopping, while Participant 14 suggested their physical mobility acted as a barrier stopping them using a bus (refer to section 5.3). This demonstrates that even if alternative forms of transport are a feasible option they might not always be a viable or practical alternative. This further enforces the need to tailor transport strategies to individual's needs and requirements. Additionally, it is worthwhile to note that not all the participants accepted or disagreed with the above definitions concerning feasibility of different modes of transport, as some participants indicated it would be physically impossible for them to cycle and therefore for them, cycling would never be a feasible option.

All participants were asked to record the duration of their trips. An online trip planner was used (e.g. https://www.google.co.uk/maps) to determine if the participants had given a fair reflection of their trips. This was considered critical, as previous research by

Rietveld (2002) has identified that most individuals (80-95%) round departure or arrival times to multiples of 5, 15 and 30 minutes. Witlox (2007) found that young children, the elderly and those with lower educational attainments typically documented their car trips less accurately than other groups.

The average trip time of the sampled population was 14 minutes per trip, close to that of Hensher's (2001) study who found the average duration of a car trip was 16.2 minutes. However, Hensher's study was based in New Zealand and compared six commuting locations, unlike this work that focused upon a case study approach of a specific urban travel corridor.

The sampled participants seemingly suggested that alternative forms of transport were a feasible option to the car but the data observed still appeared to suggest there to be reluctance by the majority of the participants, to use them. It therefore seemed logical to compare the time it would take to travel by alternative forms of transport when compared to the car for the same trip. Trip times were taken from the individual's travel diaries and alternative forms of transport trip times were taken from journey planners (e.g. National rail http://www.nationalrail.co.uk/).

Figure 5.3 compares trip times between different forms of transport and peak hours. In total, 69% *(n=112)* of trips were quicker by alternative modes of transport at peak times, however only 19% *(n= 31)* of trips were quicker at off-peak times in comparison to the car. Figure 5.3 seems to imply that the bus is a poor alternative to the car in terms of travel time; at both peak and off-peak times. On the other hand, another justification indicated that the car allows for travel from door to door. Individuals suggested that they might have to interchange between modes of transport in order to get to their destination (i.e. use a bus and train service). The advantages of being able to travel from door to door, for example, directly from a person's home to their destination, have been extensively researched e.g. Pnevmatikou et al. (2015) and Lang et al. (2016).

Therefore, in order to enhance and promote alternative forms of transport, transport operators should attempt to further promote the benefits of travelling at peak hours and develop alternative transport routes which meet individuals demands and needs (e.g. taking people to and from where they want to go). However it is logical to suggest that

trade-offs typically occur between the car and public transport use. For example, people often prefer or perceive it to be more comfortable sitting in their car a little longer as opposed to being crushed in a bus or a train for a slightly shorter time (Participant 16).

"I don't mind standing for s a short time… hmmm say 15-20 minutes then that fine. But if I'm going on a long distance trip between cities I prefer to have a seat". **(Participant 16)**

On the other hand, it is typically overlooked or ignored that some alternative forms of transport, such as the train or bus, potentially allow an individual to be productive with their time. However, this may depend if commuters can get a seat (i.e. for work) and it is not overcrowded and comfortable to work. This is unlike the car where the driver has to focus in order to drive throughout the journey (Lyons and Urry, 2005). For example, typically longer public transport services, such as intercity services, require passengers to have an allocated seat. Therefore despite the car appearing to be the quickest form of transport, individuals who travelled by the car may be less efficient with their time than if they had taken the same journey by alternative forms of transport.

It is worthwhile to acknowledge public transport operates might not be motivated to provide extra services at peak hours as they are not running a charitable, social service, or a service designed to improve the environment – rather they are motivated by profit. If the bus or train is already full, then why would operators be interested in or want to sell more tickets? If they provide additional train carriages then operators would need to be sure it can pay for itself and providing additional services would be feasible in terms of timetables/platform lengths etc. Travel operators instead might have a preference towards extending the peak into the off-peak hours as a more productive way forward.

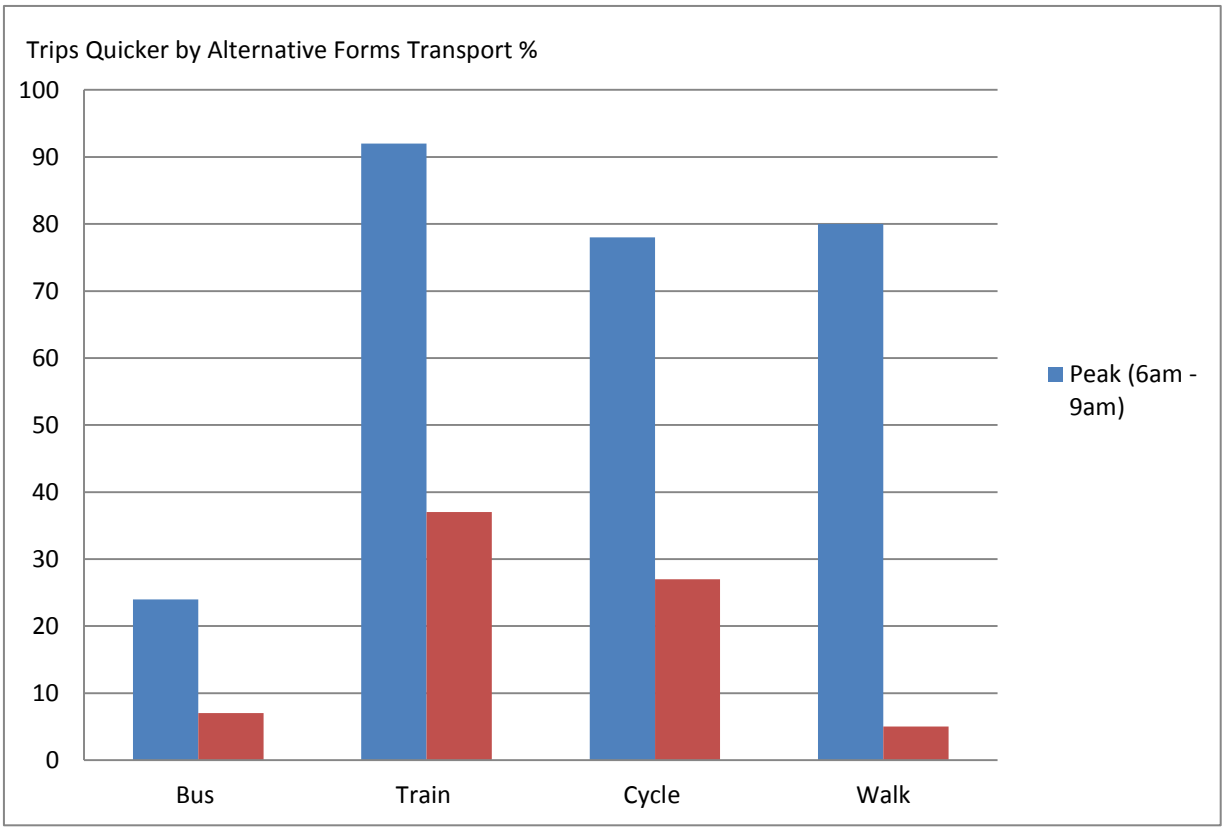

Figure 5.3: Car Trips vs Alternative Transport

5.2.2 Car Use by Demographic Characteristics

Typically, older participants (e.g. over 65) made significantly less weekly car trips and travelled fewer miles (per week) compared to younger participants (i.e. 25–65 years of age). This concurred well with previous research (e.g. Chapter 4, Section 4.4) which indicated age had a significant influence to individuals travel attitudes ($p<0.001$).

Figure 5.4 shows the average weekly distance travelled by different groups of individuals. Figure 5.4 identifies there to be a pattern between weekly distance travelled and age. For example, for every one mile travelled by participants aged over 65, participants aged 25–65 travelled a further four miles. However, Figure 5.4 also reflects there to be an association between car use and deprivation. Participants from deprivation levels 4 – 7 travelled 52% of the total distance, whereas participants sampled in deprivation levels 1 – 3 travelled the least miles. This was not accepted, as on the whole, the most deprived areas sampled for this research study were located towards the city centre and thus had a greater access to alternative forms of transport. Finally, the findings found a limited difference between miles travelled by gender (see Figure 5.4).

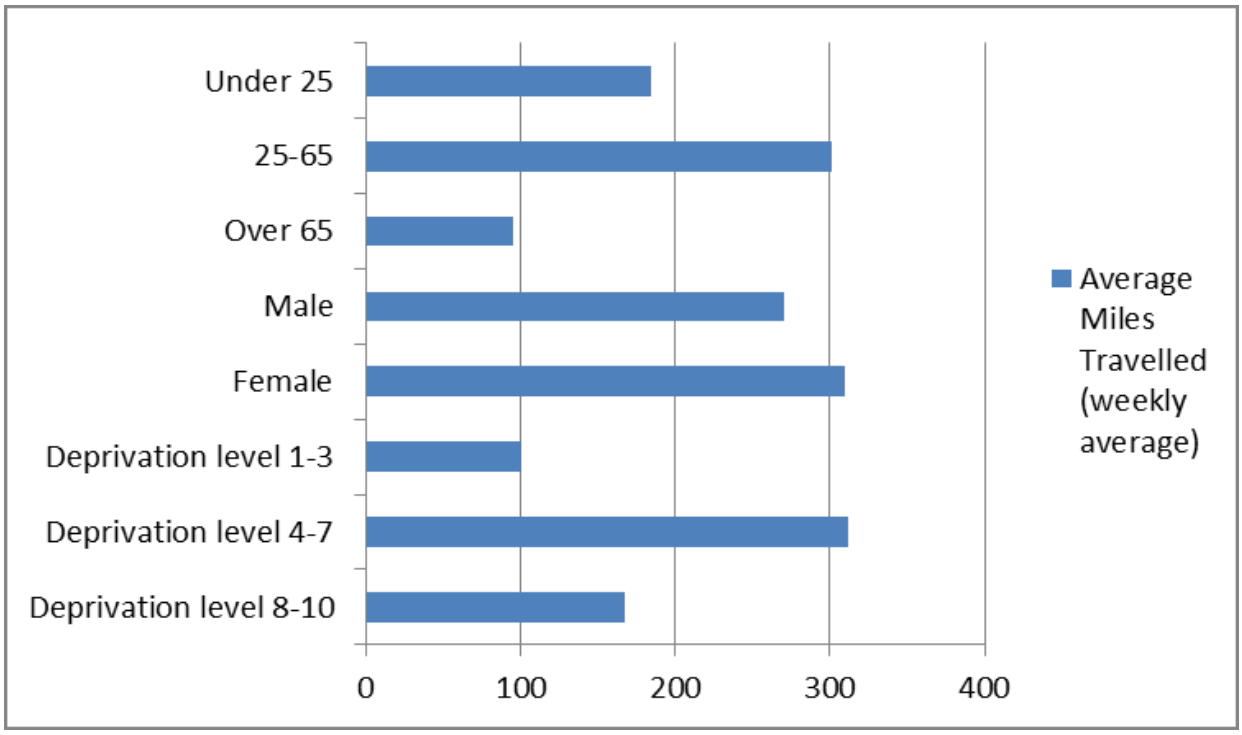

Figure 5.4: Average Miles Travelled by Demographic Characteristics

Figure 5.5 shows the average number of daily trips by age. For the purpose of this research study, the participants were informed that a car trip was from one destination to another. This concurred well with the National Travel Survey for England which defines a trip as a one-way course of travel with a single main purpose (NTS, 2014). It therefore seemed logical to use a similar definition for this research study as it was recognised the term trip is subjective, and has been widely been interpreted and discussed through previous research studies (e.g. Primerano et al. 2008; Wang et al. 2012 & Winters et al. 2010). Furthermore, as this research study wanted to capture all car trips that a participant made, for the purpose of this study, if a participant stated they left their home for work, but stopped off at the newsagents then carried on to work, this represented two car trips.

Figure 5.5 indicates that on average the participants took 9 car trips per day and ages 65 and below accounted for 86% of the daily car trips that were sampled. Once again, this reiterates the association between age and car dependency, as shown in the questionnaire survey. On the other hand, the questionnaire survey (see Chapter 4 Figure 4.3) also found younger individuals were more willing to reduce their car use. Therefore, despite the findings appearing to indicate younger ages typically make more car trips than older ages, they might be more willing to reduce their car trips in favour of alternative forms of

transport, if the right transport strategies are developed. Figures 5.4 and 5.5 further suggest that there is a lack of supporting infrastructure concerning alternative forms of transport in order to persuade individuals to reduce their car use. For example, Figure 5.5 suggests that an individual's car dependency peaks between the ages of 25-65. Therefore Figure 5.5 appears to illustrate that if planners and policy makers want to make the greatest impact on reducing car dependency, a greater focus should be paid towards those individuals aged 25–65. However, it should be recognised that current transport strategies currently target specific groups by offering discounted travel on public transport; for example, weekly, monthly or annual travel cards for use in West Midlands, and some travel tickets provide discounts into attraction parks, e.g. theme parks and museums.

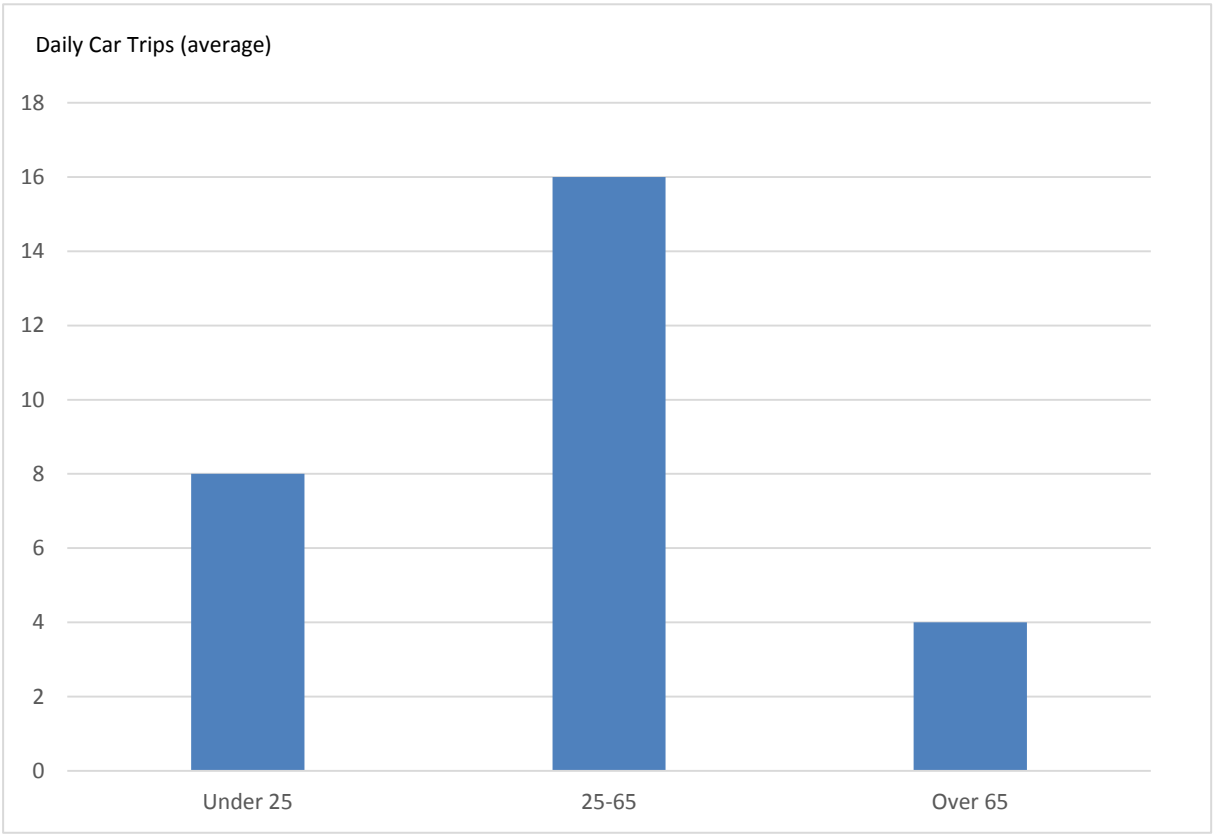

Figure 5.5: Daily Car Trips by Age

5.2.3 Perceived Trip Time and Cost

All participants were asked to indicate the time they perceived their car trips to take (to the nearest minute). Figure 5.6 illustrates which age groups are most likely to travel at different time intervals throughout a typical standard working week. On the whole, the data

indicated that those under 25 and above 65 travelled at irregular times throughout the day (i.e. at no standardised time) and typically at off-peak times. This was in comparison to participants 25-65 who typically travelled at standard hours (i.e. between 6am and 8am) throughout the day and generally at peak travelling times.

It has been well documented that non-workers (e.g. unemployed, retired and students) typically travel outside of peak hours (e.g. Calvert, 2009; Cohen, 2014 & Arellana et al. 2013). However, the uniqueness of this research was that it focused on individuals who were all car dependent and therefore it advances transport understanding amongst a specific group of road users, regardless of employment or health status - which previous transport research has typically been focused towards (e.g. Dobbs, 2007; Banister and Berechman, 2001 & Church et al., 2000). Therein, transport stakeholders (e.g. local and national policy makers) could use this work to further target strategies at different groups of the population.

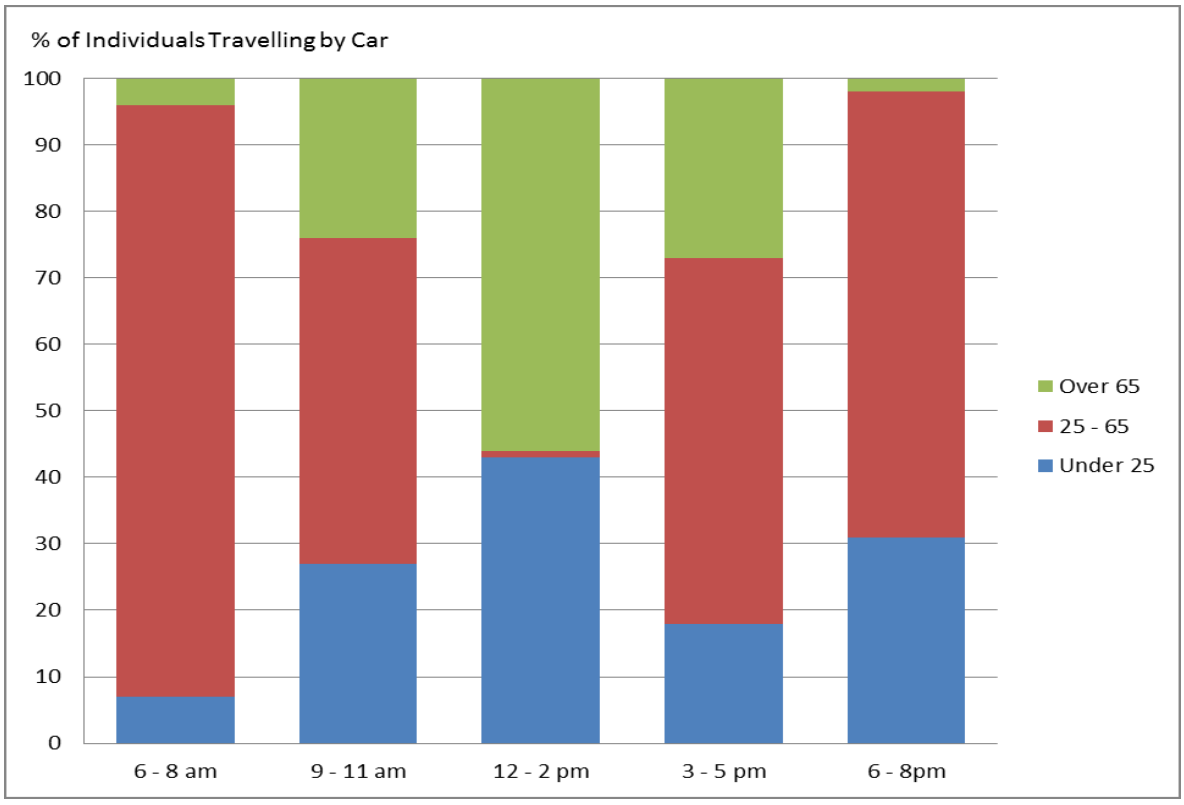

Figure 5.6: Percentage of People Likely to Travel by Car at Different Time Intervals

The final aspect of the travel diary explored participants perceived trip costs for a specific car trip. It was recognised that most participants suggested public transport was too

expensive, and hence they preferred to use their car. Although on the other hand, this might suggest individuals perhaps had a misconception concerning alternative forms of transport as respondents who are car dependent might be unfamiliar with the access to discounted travel. At no stage throughout this research study were participants given specific guidance (i.e. travel factors to consider) regarding how to calculate their perceived trip cost. The participants were deliberately ill-informed and only provided with a brief example of a trip cost (refer further to Appendix 5) for the following two reasons:

1) To not manipulate participants' responses.
2) To attempt to gain a true and fair reflection of what individuals perceived to be the trip cost for a given car trip.

For the purpose of this research study, the actual cost of travelling by a car was based upon data provided by HMRC (2015). The actual car cost included factors such as fuel, depreciation, taxation, MoT and servicing. The research identified that the sampled individual's car costs per mile were all different and were heavily dependent upon the type of vehicle used (e.g. model and fuel type) for a specific trip, individual driving styles and if individuals travelled in congestion. Further, cost such as driving style (e.g. braking heavily at traffic lights) and if participants travelled in congestion were recognised. However, it was not within the ethical limitations of this study to physically monitor individuals in relation to their driving habits.

Overall, regardless of age, gender or deprivation, participants underestimated their trip costs. In total, sixteen out of eighteen participants indicated that they only considered the cost of fuel when calculating their trip cost. Only two participants calculated their cost of travel accurately, as they considered other costs than fuel (e.g. servicing and road tax). In the main, the participants predicted their average cost per mile was twelve pence. This represents a broad misconception and underrepresentation of the actual price of car travel, perhaps partly as a result of clever promotional marketing by car manufacturers or poor marketing travel campaigns to promote the financial benefits of travel by alternative forms of transport. Figure 5.7 provides a breakdown of perceived trip cost per mile (in pence) for each participant.

In the main, participants underestimated their trip cost as they often neglected, ignored or forgot potential additional costs such as tax, MoT, servicing, depreciation or car parking charges. This concurred with Ivehammar and Holmgren's (2015) research who suggested that travellers might not be fully aware of and factor into account the full monetary expenditure when travelling by different forms of transportation. Shiftan and Bekhor (2002) investigated individuals perception of the cost of their car travel, finding that most individuals are typically unsure about how to calculate their car trip costs and often only consider the cost of the fuel. Despite it being well known that individuals typically are unaware of the full extent of the car cost this work has identified, no strategy has been implemented which has changed car travellers understanding. Therefore this perhaps suggests that new strategies are required to promote and recognise the financial benefits of traveling by alternative forms of transport that are particularly aimed at those individuals who are highly car dependent. A representative response to how the sampled population calculated their car cost is provided below:

"Well I worked it out on the petrol, of course at the time it was only just over a pound a litre, it had gone down at the time, it's gone up a little bit since then, so I just sort of roughened it out a bit really what I thought it would cost" **(Participant 1).**

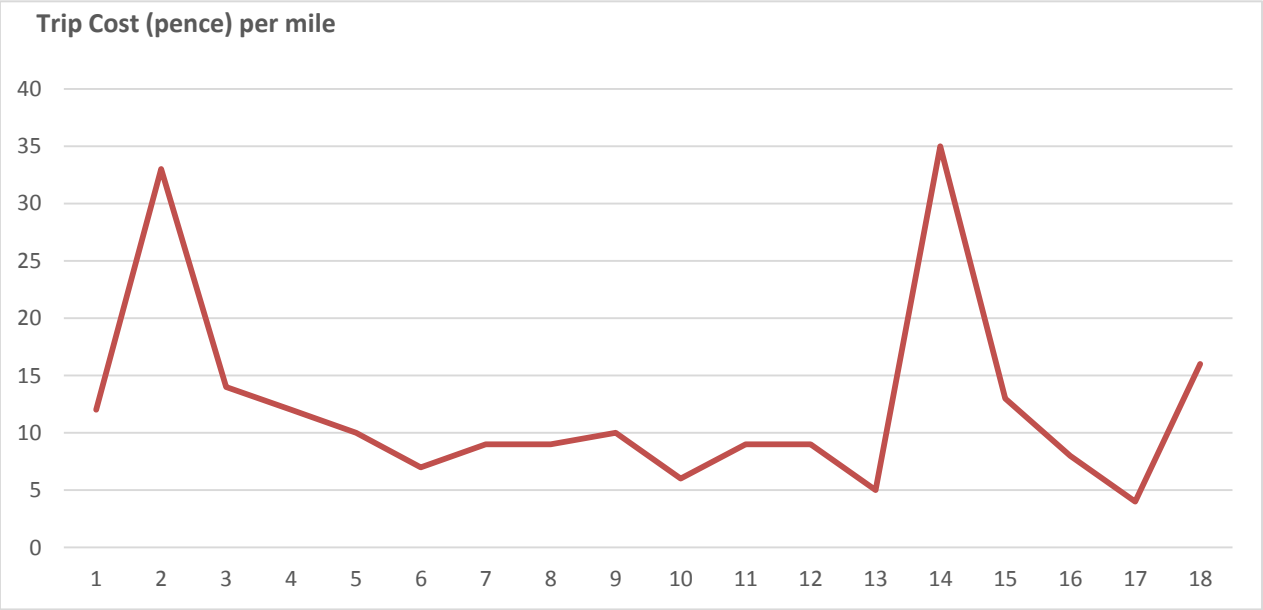

Figure 5.7: Participants Perceived Trip Cost

In order to gain a greater understanding of how the sampled participants had developed and perceived their overall travel costs, face-to-face follow up interview discussions were conducted. The participants were informed of their actual car costs. Car costs were calculated based upon the information participants provided in section one of the travel diary. In general, the reactions gained from the participants were surprising, and on the whole, the participants accepted they had potentially underestimated their car costs. As a result, three broad responses were gained when the participants were informed of their travel costs. The three broad responses were achieved and a summary for each is given below, and Figure 5.8 provides the percentage breakdown for each response:

1) Acknowledgment of only considering the cost of fuel. But accepting, on reflection, that additional costs existed (for example refer to Participant 1, above). In general, this was the most common response gained from the participants.

2) Acceptance of additional costs. Participants sought to infer that these additional costs are typically either annual or one-off costs that are initially considered expensive but easily forgotten (for example, Participant 4).

3) Emphatic refusal to accept additional costs. Arguing additional costs such as servicing or parking charges were too variable and heavily dependent upon an individual's mileage (for example, Participant 7). However, it was considered if an individual used their car less, it would presumably be more likely to pass an MOT and require less service maintenance, therefore costing them less.

"What I did was I worked out, or I thought about roughly how many miles per gallon I do and more or less sort of broke down the amount of money per gallon according to the mileage I did. But what I didn't take into account of course was the servicing and all the other associated costs. But I've got to say I do perceive car usage as quite a cheap form of transport even though in reality it isn't because you only get the peaks of cost at the MOT service time and then you forget about them. You know you think oh my God 500 quid and

then it's just forgotten a few weeks later and you're happily driving around again" **(Participant 4)**.

"But then the thing is I've still got to pay to still have a car, even if I cycled into work, even if I caught the train every day I would still have a car, so I'd still be paying for the MOT every year and then in effect my MOT is costing me more because I'm hardly using it" **(Participant 7)**.

Of the eighteen participants, two were an anomaly to the rule when calculating their car cost. One participant calculated their car costs accurately, and another, Participant 14, received a mobility allowance and held a blue badge and was therefore exempt from additional costs such as servicing or road tax as the allowance paid for these costs. Therefore Participant 14 only needed to consider the cost of fuel. This reconfirmed the need to tailor FTS based upon different individual's circumstances.

On the other hand, the findings could go some way to informing transport stakeholders (e.g. planners, policy makers and campaigners) about strategies to potentially impact travel attitudes. Examples of how FTS had different relevance to participants included feeling too old to cycle or that their health stopped them from cycling, whereas another participant suggested, charging points for their motorised wheelchair would be more advantageous than cycle racks (refer to participants 3 and 14). Finally, the findings from the questionnaire survey and travel diaries reconfirmed transport strategies will not influence all individuals' travel attitudes identically, and will affect them differently. This further demonstrates the importance of understanding the needs and requirements of different urban demographic characteristics in order to tailor transport strategies to meet the travel needs and requirements of different individuals.

"Anyway I'm a clergyman, I love trains, all clergy love trains, I don't know why but we do. If I use public transport I always use the train. Of course we're not that near a station here, we're between stations…I'm now too old and too fat to cycle or walk anywhere".

(Participant 3)

"…you can't take a motorised motability scooter on a bus there's no changing points…I mean public transport does accommodate wheelchair users…. One wheelchair maybe, but then of course you have to fight your way past the baby buggies and maybe we shouldn't start on that one, because you can get…it can be quite difficult… and this makes me not want to use public transport… see a cycle rack would be no use to me". **(Participant 14)**

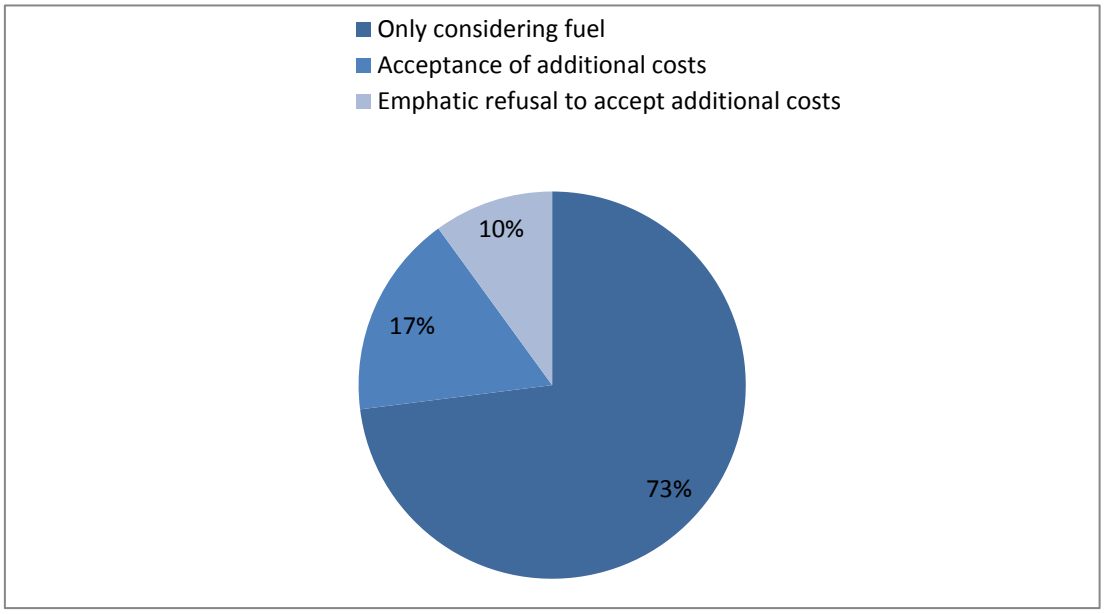

Figure 5.8: Typical Response Gained from Participants

5.3 Interviews Interpretation: Travel Diary Participants

In total, twenty-three interviews were conducted. Interviews were conducted between two sample groups: travel diary respondents and transport experts (refer further to Chapter 3 for an in-depth methodological discussion). This section covers each in turn.

5.3.1 The Problem

The initial eighteen interviews were split into two key areas. Firstly, interviewees were asked to discuss how theoretical FTS or incentives might affect their ability or willingness to reduce their car use. Throughout each interview, the participants were reminded that all of the FTS discussed were based on the findings of the earlier work conducted for this research study (i.e. questionnaire survey and travel diary), and it was emphasised that the chosen FTS were derived from that. Only the FTS or incentives that were identified to have a significant or likely impact on reducing individual's car use throughout Chapter 4 were chosen to be investigated further; this seemed to be the most logical approach. In doing so, this provided a useful starting point for initial discussions

between the interviewee and interviewer. The three FTS, which were initially discussed are summarised below. However, as the interviews were semi-structured, further strategies were explored.

1) Public transport fares decreased by 25%.
2) Congestion charge (similar to that of a London style congestion charge) was implemented at £5 per day, but cycle lanes and public transport facilities were commonly available.
3) No change to your commuting distance but public transport and cycle lanes were commonly available.

It was the intention of the interview discussions to understand and investigate further individual's responses relating to the FTS or incentives that were shown to reduce car use. In turn, the aim was to inform transport stakeholders (e.g. planners or policy makers and campaigners) of the justifications behind the findings of this study and the strategies that would most likely reduce car use, achieving **OBJECTIVES 3 & 4.**

The second section of the interview discussions explored theoretical transport measures that could be implemented or developed by transport planners and policy makers to increase individual's willingness or desire to use alternative forms of transport. The measures were derived from the first section of the interview discussions and informed by the findings from the questionnaire surveys and travel diaries. Throughout the analysis of the initial eighteen interviews, it was considered worthwhile to highlight potential limitations that might be associated with the proposed hypothetical measures, which were outlined by the respondents. Therefore, it was considered beneficial to discuss with transport experts the practicalities and barriers that might result when implementing the FTS.

The respondents discussed a range of travel measures which might impact their car use, and nine key areas emerged from this work; each area is discussed in turn below. They were: cost of public transport; segregated cycles; individually designed public transport services; reducing overcrowding, increased segregation on public transport; frequency and reliability; security improvements; education of transport users; highway design and investment. It is acknowledged the strategies discussed in this work are similar to other

research studies. Although this empirical work is based on specific travel corridor and sampled population, which is frequently overlooked, further discussion can be found in Chapter 6.

5.3.1.1 Public Transport Cost

In order to develop a discussion with the participants concerning the cost of public transport it was deemed necessary to calculate the cost of a participant's regular car trip. Information concerning individual's car trips was gained from their personalised travel diaries. This allowed for the actual cost of their car trip based on HMRC (2015) to be calculated and compared with their stated car cost from their individual travel diaries.

Once a typical trip was chosen (i.e. a daily car trip), the cost of using alternative forms of transport was then calculated and compared to the actual cost of driving. Further discussions were then held. For the purpose of this research, a typical car trip was considered as a trip taken by the respondent at least three times per week. Before initiating discussions, the participants were informed of the actual cost for a regular car trip.

In the main, alternative forms of transport appeared to be the cheapest travel option, yet still, participants suggested they preferred travelling by car. This was expected as participants were selected based on the premises they were all considered to be car dependent. It is important to highlight that the cost of public transport varied dramatically based upon the age of the participants. For example, it is typical that participants over the age of 65 are eligible for a free bus pass (a policy applied throughout most regions of the UK). Furthermore, individuals in full-time education, or aged 25 or below are entitled to apply for a young person's travel card – allowing travel at a discounted rate at certain times throughout the day. All of which were taken into consideration.

In total, five out of the six respondents aged 25-65 suggested the cost of public transport was too expensive and transport authorities needed to develop new pricing strategies in order to potentially encourage greater usage of public transport services. For example, participants *(n=15)* described the variation between peak and off-peak fares as an example of unfair pricing strategies (e.g. Participants 2 and 3). It is worth highlighting that it was expected that different age ranges would potentially not share the same travel patterns or opinions. A justification for this was considered to be the ability to access discounted

public travel. As discussed above, some individuals, for example, those aged 16–25 or in full-time education are entitled to apply for a young person's rail card, therein giving them access to discounted travel (but not exclusive). This therefore may encourage those individuals to use public transport more than those who are not eligible for discounted travel. The current 16-25 year old travel cards allow travellers to save 20% on their rail fares.

"When I was kid they were like 15p to get to school, you know… it's about a fiver isn't it on the train now isn't it?" **(Participant 7)**.

In addition, typically older participants reflected on their childhood to evaluate the cost of public transport (for example, Participant 7). It is worthwhile noting the limitations with comparing the price of public transport services over a period of time (e.g. an individual's working life). This is because external factors, for example, inflation or the national minimum wage might fluctuate and personal circumstance might change. The data seemed to suggest a link between levels of deprivation and the cost of public transport. In general, individuals from deprived areas were found to be more affected by an increase in public transport costs compared to those participants who lived in less deprived areas. This concurred well with previous studies that have had similar findings (e.g.Paulley et al., 2006; Carvalho and Pereira, 2015; Guarda et al., 2016) and this was broadly anticipated.

The data from this study seemed to reinforce there to be no one solution towards implementing hypothetical measures and the importance to specially target transport strategies by demographic characteristics. Figure 5.9 attempts to summarise the above discussion.

"I mean we went on the Eurostar but we had to get the train at ten to six in the morning and it was £15. If we'd have caught it an hour later it would have been £120 which is more than going on the Eurostar to Paris which is ridiculous" **(Participant 2)**.

"…But he lives in Milton Keynes this guy and he said, I must leave because I've got to catch the 4:10 or whatever it was, otherwise I'll have to pay extra" **(Participant 3)**.

Upon further discussions regarding pricing, ironically, most participants (83%) suggested the current adult Daysaver, for example, was a reasonable price when

considering the number of journeys they could make in a given day is unlimited. A Daysaver is a public transport travel ticket that is valid for use on all National Express West Midlands and National Express local bus services, but only on the day the ticket is purchased. The current cost of a Daysaver ticket is £4.20 (adult).

However, in total, 94% of participants (*n=17*) argued that they rarely knew how many trips they might require in a given day and the car provided them with the flexibility to meet their travel demands. Figure 5.10 provides a complete breakdown of the sampled population's trips by demographic characteristics and indicates that the majority of them were not planned. For example, Figure 5.10 indicates that deprived and younger individuals were less likely to plan their car trips. The findings from this work present a unique insight into the behavioural attitudes of different groups of a selected population. This presents a beneficial insight for transport planners and policymakers. Previous research highlights a travel gap between deprived and less deprived communities and that mobility is inextricably linked to social class (e.g. Bauman, 2000; Ohnmacht et al., 2009; Lucas 2012). It is not known whether other research that has focused on highly deprived car users or compared how likely they are to plan their car trips. This research attempts to achieve this.

Some participants argued that for multiple trips, the Daysaver was good value for money, but often their trips were short (i.e. one or two miles). This suggests some participants considered it to be poor value for money as they did not require multiple trips and that it was cheaper to use the car (e.g. refer to Participant 9). This concurs with previous research reviewed within this study that suggested travel measures fail to meet individual's needs, for example, the questionnaire found that current travel strategies are failing to meet individual's needs, refer to Sections 4.4 & 4.5. On the other hand, this might indicate a misconception concerning the benefits of buying an unlimited travel ticket. The findings suggest travel operators should focus on promoting these types of tickets to travellers who would benefit the most from them, rather than all consumers of travel, as is the current method. This in turn might increase ticket sales amongst individuals who want to make multiple trips throughout a day, but who were previously unaware of this ticketing option.

Furthermore, the data reinforced the need to consider a new pricing strategy in order to encourage a greater uptake in alternative forms of transport amongst different demographic characteristics. In turn, if more individuals were encouraged to use public transport, it is reasonable to assume this would have a financial benefit to travel operators as their profits would increase due to an increase in passenger numbers. This research study, however, acknowledges current pricing strategies target specific demographic groups (as discussed earlier in this Chapter) although, Participant 10 outlines a potential solution for a new pricing strategy.

"I mean if I was using a £4.20 and I was going to use it all day, I think that's reasonable, you know, I had occasion once to get on and off the bus and I forget why I did it, but I thought oh that's really good, you know, I've only paid £4.20 and I've done all this today and the bus has arrived on time, which was good however sometimes it's just cheaper to travel by car"

(Participant 9).

"So they would need some system there whereby short journeys or one short journey per day was cheaper. Or else could they not have some commuter rate, or commuter pass?"

(Participant 10).

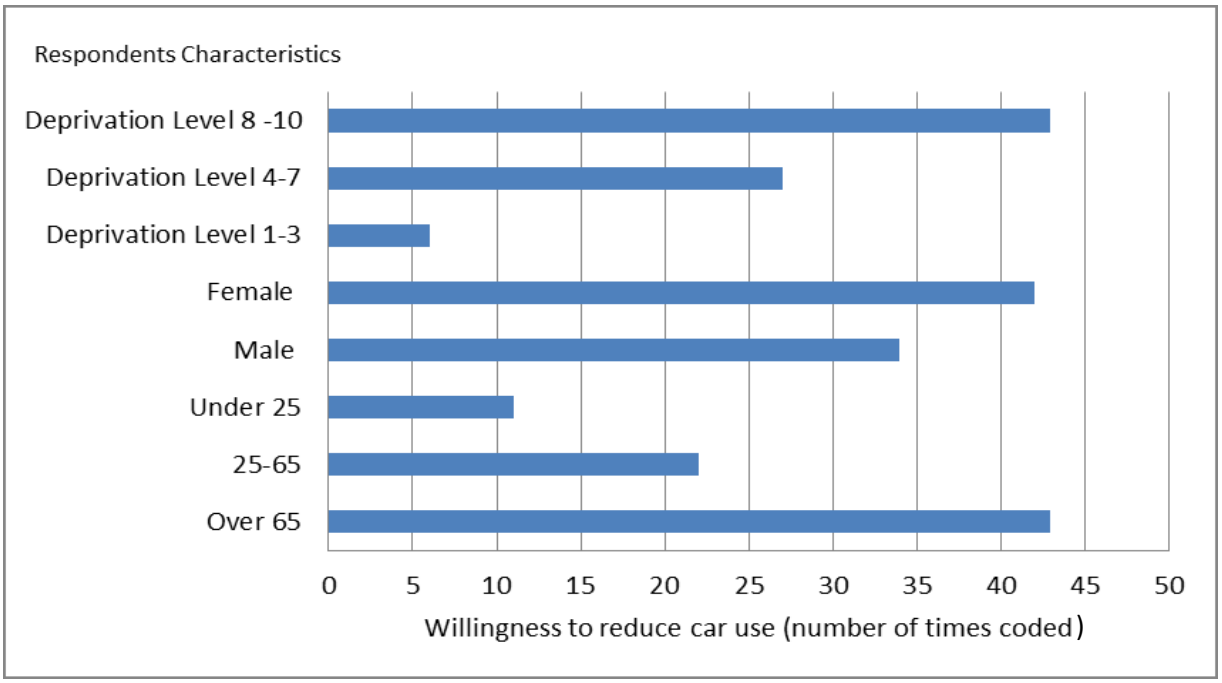

Figure 5.9: Preference towards a New Pricing Strategy

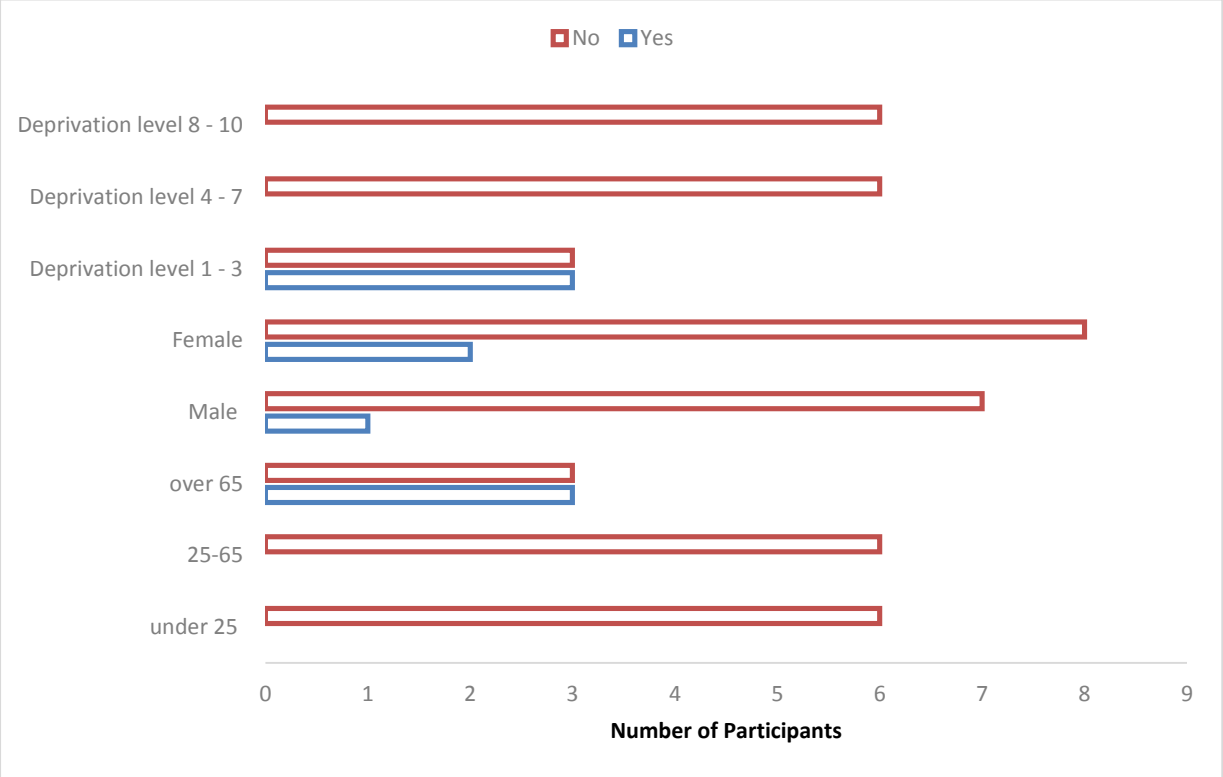

Figure 5.10: Planned Car trips by Demographic Characteristics

5.3.1.2 Congestion Charging

The concept of congestion charging has been adopted throughout some urban transport networks, for example, London and Singapore. The potential benefits and limitations have been widely discussed throughout academic literature (e.g. Ison, 2004; Rotaris et al., 2010).

All of the sampled participants were asked to reflect upon their travel diaries in order to describe how their car use might change if a congestion charge was implemented (similar to the current congestion charge implemented in London) but alternative forms of transport were commonly available. All participants were informed that a consultation process would occur before any congestion charge would be implemented, and they would have the ability to inform and influence policy. Furthermore, any profit would go to local amenities, for example, schooling, infrastructure projects (i.e. new roads and enhanced cycle and walking routes) and public transport improvements.

The current literature often suggests that when individuals have the ability to influence transport policies they are typically more in favour of them being implemented, and that their travel habits are more likely to change. For example, Börjesson et al. (2012) investigated the impact of the Stockholm congestion charge 5 years after it was implemented, and Schuitema et al. (2010) investigated the acceptability of the Stockholm congestion charging scheme. They both found most participants were in favour of a congestion charge scheme if they had the ability to impact the implementation process. This also concurs well with research associated with the implementation of car parking permits (e.g. Clayton et al. 2014 and Scheepers et al. 2014).

In order, to give participants a flavour of how future transport might look they were shown two imaginary transport street scenes (refer to **Appendix 7**) and they were informed of the term *"commonly available transport services"* which described a public transport services that operated every ten minutes. The two imaginary street scenes were designed to visually indicate how future travel could operate. The purpose of this was that all participants would have the same image concerning future travel. It is reasonable to argue that participants might share different opinions concerning future transport. Therefore, by providing imaginary street scenes it was the intention that the participants' responses would be based upon similar transport visions, however, it was acknowledged this might potentially influence the responses. Nevertheless, the participants were given the opportunity to explore aspects they liked or disliked. Further justifications are outlined in Chapter 3, Section 3.8.

Furthermore, the research acknowledges that the result of political inequality within society amongst the rich and poor, individuals who lived in the most deprived areas seemed to suggest that implementing a congestion charging scheme would affect them the most. This corresponded well to previous studies that suggested the poorest are often the most affect by increases in public transport or road costs (e.g. Shoup, 2016; Pierce and Shoup, 2013).

In total, four out of the six participants who lived in deprivation levels 8–10 suggested that a congestion charge would reduce their car usage (Participant 10), which concurs well with previous research as noted above. However, only one out of six

participants who lived in deprivation levels 1–3 suggested that their car use would decrease, which contrasts with current transport studies that suggests when transport policies such as congestion charging is implemented through consultation, travel attitudes and behaviours are more likely to change and favour such policy. This research begins to present contrasting findings based on the sampled population. Those participants who lived within the most deprived areas suggested that in order to meet the potential financial constraints imposed by a congestion charge, they would have to make significant lifestyle changes (e.g. Participants 10 & 12).

"It would certainly would put me off it; it certainly would make me think about it yes…I suppose how I'd put it, it's more the principle, why on earth should I give them another £5 (laughs), rather than not have the £5? So I would think that was a bit steep and I would not be pleased about it" **(Participant 10)**.

"if there was a congestion charge I might actually be tempted to ask if the supermarket could deliver, if that was £5, so then I might order it on a weekend and then they could deliver it at the same time" **(Participant 12)**.

In addition, there appeared to be a link between individuals who were self-employed and congestion charging. For example, all participants who were self-employed (in total, 4 Participants) indicated a congestion charge would have no impact on their car use as they had the potential to pass any additional costs they incurred onto their clients (e.g. Participant 11). However, it is critical to acknowledge not all self-employed individuals might be able to pass additional costs onto their clients. In addition, it was not explored with respondents that if congestion charges were passed onto their clients this might make them less competitive, or put the price of work beyond what their clients might be willing to pay. Figure 5.11 provides a breakdown of how individuals suggested their travel habits would be affected by the implementation of a congestion charge.

"*The idea of a congestion charge for £5 per day effectively wouldn't be an issue to me because it would go…because I'd pass on the cost to the clients anyway*" **(Participant 11).**

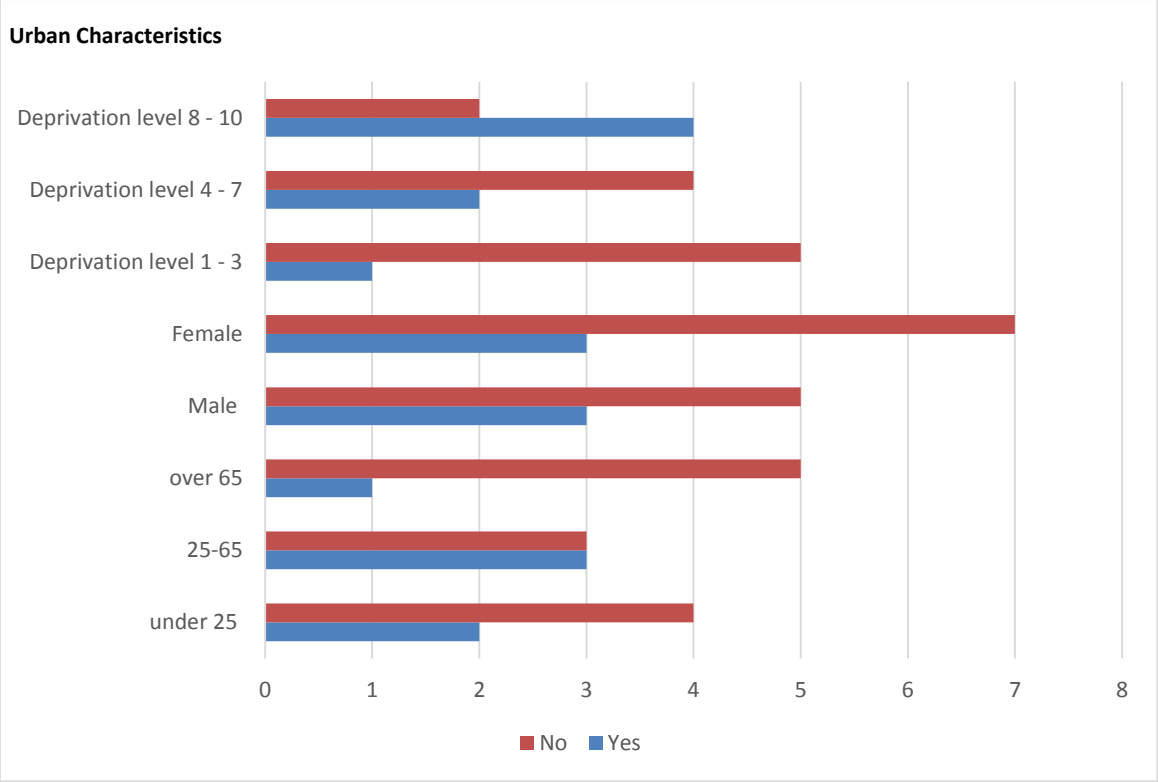

Figure 5.11: Most likely to be affected by a Congestion Charge

5.3.1.3 Cleanliness and Personal Safety

Every participant spoke about discarded newspapers, litter, chewing gum on the seats, or urination (by other members of the public) as potential deterrents for using public transport services. This research unearthed some interesting findings, as not only were interior characteristics referred to, but also potential users of public transport services (i.e. other members of the public) stereotypically referring to drunken men or people taking drugs - Participant 10). However according to recent data published by the Police and Crime Committee (PCC) drug use, for example, has fallen on public transport in London from 806 incidents in 2012-13 to 709 incidents in 2013-14 and 420 incidents in 2014-2015 (PCC, 2016). Future crime targets by 2031 include: a reduction in crime on London Underground and Docklands Light Railway (DLR) to drop by 15 per cent to 11.1 crimes per million passenger journey and a target of crime rates on London buses to drop by 25 per cent to nine crimes per million passenger journey (PCC, 2016). However, it is worthwhile to note that the respondents were responding on their own travel perceptions. This could potentially create misconceptions concerning public transport as the latest crime statistics for the UK indicate that crime on public transport services has fallen and is continuing to

decrease. On the other hand, this work suggests there is a current need to effectively promote the safety of public transport and additional transport measures are required to reassure that the alternative forms of transport are a safe method of travel.

It might be reasonable to argue it is difficult to regulate or control individual behaviour. For example, it is extremely difficult to predict when someone might discard litter, urinate or board a train whilst drunk. This may be more prevalent at certain times (i.e. night hours). Therefore, it would be logical to continue to take a common sense approach to enforce security on public transport, but increase security throughout the night. However, according to the PCC often the fear of crime is greater than the acts of crime. In other words, crime levels are much lower than what is perceived and most people have misconceptions relating to crime on public transport at night and, it is often the perception of crime that fuels behaviours and individual fear of using public transport (PCC, 2016).

It is reasonable to argue public transport operators have limited ability to control or predict anti-social behaviour and that it is not confined solely to public transport environments. Additionally, the participants frequently referred to the external environment (e.g. the waiting facilities) as a potential deterrent for not wanting to use public transport services (Participant 15). External environments such as waiting facilities have been extensively researched across a broad range of studies. For example, Turley and Milliman (2000) researched the atmospheric effects of shopping behaviour (e.g. the physical environment such as street furniture and lighting). Panter and Jones (2008) studied active travel (i.e. walking and cycling) in youths and Cao et al. (2009) investigating residential behaviour have all found that the built environment can influence individual travel behaviours but never before, has research focused on individuals who are highly car dependent.

"I don't like people smoking cannabis on the buses which there is an inordinate amount of people smoking cannabis on those buses. The smell is absolutely horrible, so I really don't like it. It doesn't make me afraid so much as I just think it's unpleasant and I don't want to sit there, and you've got to face it these people are stoned. I don't like the fact that there could be drunk men sitting there and will try and speak to you, drunk or else mental health

issues, you know and that I've experienced and I don't like it and it is off-putting" **(Participant 10).**

"If I had to stand at a bus shelter which was very dark and I said we're in a rural area, there's not always that many people about, undoubtedly…well I say undoubtedly you might feel less safe than if you were to leave work, get straight into your car and you're on the way…I feel once you're on the train and the train is moving then its fine" **(Participant 15).**

In addition, the participants intimated an association between personal safety, the time of day (participant 5) and the type of public transport, for example, a train or a bus (participant 7). Continually, the participants spoke about feeling either unsafe or more vigilant during night hours rather than day hours. Typically males were less reluctant to admit feeling vulnerable and initially indicated they could understand why others may feel vulnerable, often referring to "older" women (Participant 5). However, after further discussion, the males too admitted to feeling more vulnerable when travelling during night hours.

In total, 67% of participants (*n=4*) over the age of 65 said they felt unsafe and more policing was required on public transport services during night hours. This compared to 34% of participants (*n=2*) under 25 (refer to Figure 5.12). Interestingly, Figure 5.12 indicates typically younger and older participants seemed to prefer more policing at night hours compared to participants aged 25-65. This could be because travelling alone on public transport was a new experience for younger participants, as previously they might have travelled with parents or guardians and therefore they were less familiar with the experience of travelling alone. Previous research has suggested individuals prefer travelling or undertaking their daily routines (i.e. shopping) in the day rather than the night (e.g. Fontoynont, 2014; Miranda, 2011; Johnson et al., 2013) and this also concurred well with the findings of the research, as shown by Participant's 5 and 7. This might indicate there is no association between an individual's willingness to use public transport at night hours (as previously suggested in the questionnaire survey and interview discussion); rather it might be connected to an individual's routines and personal preferences.

"No I think the time of day is a factor especially for certain, you know vulnerable women, that's an even bigger factor" **(Participant 5).**

"Yes, and it's interesting because my daughter came into the city centre with her friends and I thought she was catching the train and she ended up catching the bus. One of my daughter's arguments for catching the train rather was that she thought that would be safer than being upstairs on a double decker bus in the city at night" ***(Participant 7).***

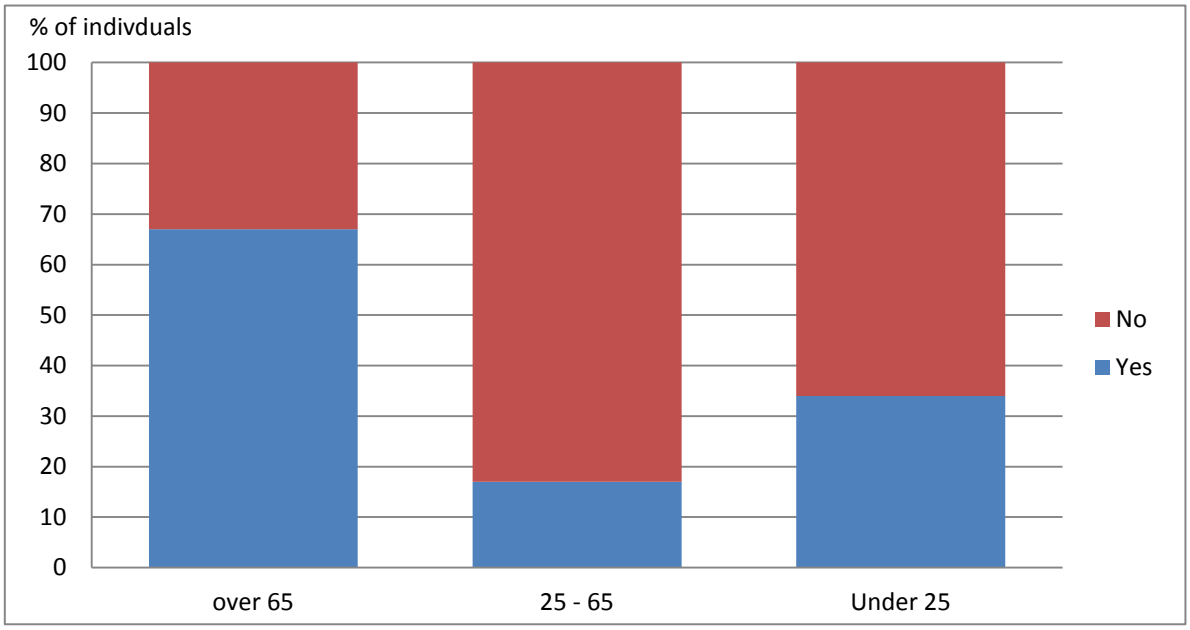

Figure 5.12: Favouring Policing at Night (shown as percentage)

One of the major factors that potentially may have led to this misperception was the current lack of interpersonal relationships throughout society. In the main, this was suggested by the older participants (i.e. aged 65 or over). They suggested there to be a lack of community spirit. For example, often participants reflected upon there being a lack of respect between cyclists and other road users (typically referring to car users) and it was suggested that either people no longer, or were currently too afraid to look after each other on public transport (Participant 3). To enhance interpersonal relationships (e.g. between different members of the community i.e. the young and old) it was suggested by some participants *(n=10*) to increase levels of alternative transport engagement, potentially through advertising and financial incentives (Participant 1). It is important to recognise that national or local financial incentives have been developed and encouraged (e.g. private and public sectors) such as *cycle2work* schemes that aim to promote an increase in use of alternative forms of transport. This might be another example of how transport strategies

have been developed to promote a greater usage of alternative forms of transport however they seem to be misinterpreted or are currently failing to meet individual's desires.

"… We live in a society that is obsessed with individualism. People just consider themselves they don't look out for one another. If someone is in trouble in the street on the bus people close their eyes. People are too affair to stand up for one another in the fear of getting stabbed or shot" **(Participant 3).**

"I think another big thing is just managing people's perceptions and awareness…which could be as simple as just advertising more, like billboards of people cycling encouraging it and adverts on TV encouraging cycling as opposed to just like you know financial incentives" **(Participant 1)**.

5.3.1.4 Transport Realm

In order to discuss the transport realm, the participants were reminded of the two imaginary street scenes and then asked to reflect upon their travel diaries (see **Appendix 7**). The aim was to allow the participants to reflect upon their travel patterns and imagine that their car trips were through similar environments. A potential limitation of this approach was that this use of imaginary is often considered hypothetical and unrealistic. However, by providing all participants with the same futuristic travel scenario, the intention was to give all the participants the same starting point to respond to the questions throughout the interview.

All participants were asked to describe and justify features of the imaginary street they most preferred. Continually, the participants seemed to reiterate a willingness to want to use alternative forms of transport but suggested, for example, cycle lanes were currently too unsafe (*n=17*) (e.g. Participant 4) or that bus and train services were either too unreliable or infrequent (e.g. Participant 9) – concurring well with previous research from this work (i.e. questionnaire survey). This however was still unexpected because all participants who took part in the interviews were considered highly car dependent. It was therefore it was not expected that this study would identify that most participants would be willing to use alternative forms of transport, which reiterated the need for new transport strategies.

"I'm not against cycling but I'd be very wary about cycling on the roads, particularly the Bristol Road and I'm very wary of…I'd be very wary of busy junctions" **(Participant 4)**.

"I'd definitely use buses more if they were frequent… they need to come every 10 to 15 minutes" **(Participant 9)**.

Furthermore, it was suggested that freedom of movement, the ability to listen to music, family commitments (Participant 7) or the lack of joined up thinking between travel operators were all justifications as to why the respondents suggested a preference towards the car. For example, participants who visited the theatre indicated that they wanted to use alternative forms of transport, but often spoke about their frustration that the last bus or train service was too early and they would miss the final one (refer to Participant 8). However, Figure 5.12 previously indicated that there was a current reluctance to use public transport throughout night hours; in the main, this was due to concerns relating to safety and the perception of an inadequate service provided at night hours. Therefore, if later services were provided, there might be more of a willingness amongst individuals to use alternative forms of transport if some of the security measures were implemented, as described throughout this chapter. The findings of this work are similar to previous studies, such as Beirão and Sarsfield Cabral, 2007 or Baltrunas et al. (2011) who investigated factors that might influence travel behaviour and attitude, and this therefore indicates that individuals who are highly car dependent might share similar travel attitudes and behaviours to other social groups.

However, it should be considered that transport operators are private companies who want to maximise their profits and might have limited willingness to provide later services if the service was considered to be unprofitable. However, night public transport services are popular amongst some commuters and have been reintroduced in some cities. For example, a 24-hour tube service was introduced in London on some services in 2016. Further still, Evans (2012) suggested transport can play a key role in promoting a night economy and enhances a city's competiveness. Further barriers discussed for not wanting to use alternative forms of transport were found to include: environmental conditions (Participant 12), the need to carry shopping bags (Participant 2), a lack of confidence to use alternative forms of transport or personal and professional appearance (Participant 10).

"*Well the thing is I had my car…a lot of it was to do with my daughter being born and suddenly getting invited to parties and relying on lifts from other parents"* **(Participant 7).**

"It like when I go to the theatre, the buses or trains simply don't run late enough. You often see people having to leave early to catch the last train or bus. You feel you can't enjoy yourself afterwards and are continually checking your watch" **(Participant 8)**.

"So even though I have to tie my hair up for work anyway, which is work, but if perhaps say I was doing something where I'd expect you know to be very professional in a suit, that would be different. I don't work in a suit, but at same time with working with a lot of people I need to appear, well dressed to a certain point and not look like a mess if it's been snowing, raining on the outside" **(Participant 12)**.

"Do you want to know what I don't like and I know its stupid right, with talking about drawbacks to cycling. I don't like having to wear a helmet, now I know its safety and all this you read, but I feel an idiot, I feel uncomfortable, I didn't grow up wearing a helmet and I would have to do my hair again" **(Participant 10)**.

"Like up to Northfield if you're not doing much shopping you could walk up there but if you've got heavy bags" **(Participant 2)**.

"But I think if the roads looked much more like this then I think it would be enjoyable to cycle actually. Whereas I feel a lot of people…well I've already mentioned I'm not the most confident cyclist and cycling can be very stressful when you're cycling within the traffic, especially at rush hour and you know there's space for cyclists to breathe here, there's no worry about the traffic…I've actually cycled much more in Europe…they have a system much like this where it's actually separated, more like in Figure 2, where they have like a single line just away from the traffic. I cycled there and I felt very comfortable cycling there" **(Participant 15).**

On the other hand, surprisingly, all participants indicated an increased willingness to use alternative forms of transport when they described a trip into an urban area (e.g. city centre). The participants often stated a preference to use alternative forms of transport in urban areas due to a perception of there being high levels of road congestion, high parking

charges and traffic restrictions (Participant 3). The findings of this work are interesting but also contrast to some previous studies. For example, this work differed from Schwanen et al. (2001) who indicated that older people, irrespective of where they live have a preference towards using the car for their daily trips.

"If I have to go into central London which I do from time to time if we're having a big social event or a presentation or something and I've got PowerPoint, a screen and all that to take, I mean it's impossible to use the car, there's cars everywhere. But I will do almost anything to avoid taking the car into central London" **(Participant 3).**

These findings unearth an interesting outcome which was unknown throughout Chapter 5, Section 5.2, regarding travel preferences of the sampled population when travelling in areas that have the potential to experience road congestion; for example, in an urban environment. The sampled population indicated a preference towards travelling by alternative forms of transport in urban environments as it was generally easier to travel by alternative forms of transport, or simply, they suggested it was impossible to travel by car (e.g. Participant 3). Therefore, this might suggest there is a need to increase the usage of alternative forms of transport, and transport planners and policymakers should attempt to increase road congestion and prioritise alternative forms of transport on the highways. This however is against some local planning policies, for example, in Liverpool which has actively prompted the reduction in bus lanes since 2013.

5.3.1.5 Interchange Links

Finally, participants described how the links between current transport services could be improved. A link was described as the ability to interchange from one alternative transport mode to another. For example, the ability to securely lock or secure a bicycle (i.e. sheltered cycle racks) in order to catch a train or bus. The interviewees frequently spoke of inadequate storage, changing facilities or designated segregated cycle lanes. A general opinion amongst participants seemed to indicate a need to increase the number of segregated zones (i.e. enhanced storage for bags or additional carriages that are designated as mobile free or quiet zones) particularly at peak hours in order to meet the travel demands of commuters (e.g. Participant 7). In total, 87% of participants *(n=16)* spoke about the current inadequate links between alternative forms of transport.

The current lack of segregation seemed to reconfirm issues associated with interpersonal relationships regarding the acceptance of cyclists using public transport services. For example, Participant 15 referred to a time they had witnessed when passengers moaned and sighed when cyclists boarded a train. It is worthwhile to highlight that the sampled population were all highly dependent on their car for their daily travel needs and therefore respondents might have had misconceptions of alternative forms of transport. For example, if an individual relies upon their car for their daily travel trips they might be unaware of a new segregated cycling route or cycle storage. Furthermore, typically it was found that participants reflected on a single period of their public travel experience and often focused on the negative experience rather than the positive. This work concurs well with Westerhof and Bohlmeijer (2014) who researched how participants often reminisce on negative experiences ignoring positive travel experiences.

"You want every train to be six carriages…they're fine at 2 o'clock in the afternoon but at 8 o'clock in the morning and at 6 o'clock in the evening they're just hopeless people are crammed in this really puts me off wanting to use the train. And the buses are like it as well and the bus is really expensive for what you get out of it" **(Participant 7).**

"…whenever you do see a cyclist there's often a few glances from other members of the tube who believe you're taking space up" (**Participant 15).**

The next section of this chapter analyses the second section of interviews – theoretical measures that could be implemented by transport stakeholders to reduce individual's car use.

5.3.2 Theoretical Measures or Incentives to Reduce Car Use

Throughout the initial eighteen interviews, all participants were asked to recommend and discuss potential measures or incentives that could theoretically be developed to reduce their car use in order to promote a greater usage of alternative forms of transport. The practicalities of implementing such transport strategies are explored in the proceeding section and they are based on discussions with transport experts. In total, nine future transport planning measures were conceived from the interview discussions:

1) **Public Transport Costs:** The cost of public transport provoked intense discussion. In general, there was a feeling amongst participants (particularly those over the age of 65) that the current cost of public transport was too expensive and needed to become more person-specific to reflect the journeys of individual commuters. However, it should be recognised that this might not be practical or effective and could complicate the ticketing system if fares were based upon individual's travel patterns. Also, in reality, travel operators want to maximise their profits, as they are operated by private companies and they focus on this rather than providing a service. On the other hand, it is important to recognise, as discussed previously throughout this chapter, that travel operators currently offer different fares (e.g. based upon age). Different pricing strategies recommended by participants are discussed in turn below:

    - In total, 16 participants suggested to pay for a set number of journeys at a reduced rate within a specified zone, for example, similar to the current way of paying for transport services in Holland e.g. Strippenkarten. This might allow individuals to purchase a set number of journeys in advance, enabling passengers the flexibility to use tickets when it is most convenient for them – currently Daysaver tickets are only valid on the day of purchase. In effect, this would replace the traditional all-day tickets (e.g. Daysaver).

    - An alternative approach was presented by participant 15 (as detailed below) who proposed to reduce public transport fares at peak hours. They suggested reversing the cost of peak and off-peak fares. However it might be reasonable to argue that peak hour services are the most profitable times for transport operators and therefore they might be unwilling to reduce their fares throughout theses time periods. Off-peak times for bus services in Birmingham are from 09:30 – 15:30 (Monday to Friday). However, it is worthwhile to note participant 15 was referring to public transport in Finland, where between the hours of 02:00 and 04:30 public transport costs increase. However, Finland is recognised in Europe to have one of the most efficient and user friendly public transport systems, which is heavily subsidised by the

government, this is unlike in the UK transport system that is privatised and continues to receive less state funding each year (European Parliameent, 2016).

"…in Finland something I was not aware of, the charges are in effect reversed. So the peak hours are when the travel is at its cheapest and the off-peak hours are when the travel is most expensive….they view things over there is the peak hours are when transport is more essential, you know the government is providing a service to help people get to work, so that's why it's cheaper. Whereas in off-peak hours for example late in the evening the travel is in a way none essential" (**Participant 15).**

- All participants suggested they dislike the current ticketing system which bases fares on the time of the day (e.g. peak and off-peak fares) and would prefer a standardised fare, regardless of the time of day. However, perhaps individuals who work flexible hours prefer peak and off-peak fares as they can chose the cheapest travel option for them, and a standardised fare would detract them from using alternative forms of transport, as it would be the same cost regardless of the time of day. It is logical to presume that if peak fares were scrapped in favour of an all-day fare, travel providers would still require and want to make the same profit, and therefore ticketing prices would not be reduced. It is reasonable to assume that a greater number of commuters commute throughout peak hours and this is when transport operators make the most profit. Thus, those individuals who choose to travel at off-peak hours, because they have the flexible to do so, might have to pay more for their travel.

- When discussed what would be the preferred daily charge, 94% of participants indicated that a maximum cost of £3 per day should be applied to all public transport fares within the West Midlands. However, this might not be a feasible policy as most travel services are operated by private companies who aim to maximise their profits. In addition, if transport services needed subsiding, it is unlikely in a time of austerity and political

uncertainty, which has been predicted by some in the aftermath of Brexit, the government would be unwilling to provide additional funding.

- Finally, one participant suggested free travel within a selected travel zone (Participant 16). However if public transport services were free this could result in an increase in taxation (i.e. National Insurance), regardless of the maximum or minimum an individual might require public transport services. In a period of austerity it is reasonable to suggest that increasing taxation would be an unpopular policy. This could therefore lead to the greatest burden being placed upon the most deprived communities, but it could also result in issues associated with equity for individuals who lived outside of the selected zone. This would be similar to the Fares Fair policies of the early 80s in London and South Yorkshire. The policy was legally challenged, as it was considered to not benefit everyone, as individuals who did not use public transport had to pay more taxes for services they did not use. This is discussed and explored further in Chapter 6, Section 6.4.

"I think free public transport would send a really strong message and I'm not awfully sure it would be that expensive in the big system of things" **(Participant 16).**

2) **Segregated Cycles Lanes:** Participants (*n=15*) seemed to infer that cycle lanes were currently tokenistic and did not encourage cycling as a viable alternative to the car (refer to, Participant 8). However, it is recognised cyclist are not a homogenous group of individuals and some cyclist prefer cycling in traffic and dislike segregated cycle lanes that often take a longer route (Parker et al., 2013). Nevertheless, Parker's research, which explored how to increase cycling in New Orleans concludes by highlighting implementing cycle lanes had the greatest effect to increase individual's willingness to cycle. This also concurred well with more recent research by Sander (2016). Her research was based on an Internet survey in San Francisco Bay Area amongst 265 non-bicycling drivers, bicycling drivers, and non-driving bicyclists. Sander's findings revealed that most cyclist, despite different user groups, preferred roadways with barrier-separated bicycle lanes, and this was regardless of bicycling frequency. Therefore, it is widely accepted segregated cycle lanes will have the

greatest effect on increasing cycling rates. In order to encourage a greater uptake in cycling most participants suggested all cycle lanes should be completely segregated from other road users, such as pedestrians or cars users, and link areas of significance together (e.g. employment; retail or residential areas). It is worth considering where these cycle lanes would be implemented. For example, it could be impractical to develop new cycle lanes along the existing road network. Furthermore, the 15 participants suggested all cycle lanes should be maintained to a high standard, for example, similar to that of the highway network (within the UK) (see Participant 13). It should be recognised that throughout the interview discussions it was not the intention to discuss how the proposed transport measures might be funded and who would be responsible (e.g. for maintenance). However, the interviewees were not discouraged from discussing potential limitations. As previously outlined, it was considered further interview discussion with transport experts would discuss the practicalities and barriers towards the FTS measures and incentives discussed. It was unsurprising segregated cycle lanes were a topical discussion through the interviews. A current transport policy in Birmingham is to encourage a greater usage of cycling (5% of all journeys in 2023 to 10% by 2033) (WMCA, 2017). Furthermore, the West Midlands Combined Authority (WMCA) has ambitions to introduce a cycle hire scheme (similar to the Boris bikes scheme in London) by 2018. However, this indicates a limitation of this research as it was based on a single travel corridor. For example, if this study had focused on a travel corridor, which has access to a cycle hire scheme or good segregated cycle lanes, the findings might have been different. However, the purpose of this research was to investigate a specific transport area in order to understand how to reduce car use in favour of alternative forms of transport (refer further to Chapter 1, Sections 1.3 & 1.4).

"I mean particularly if you drive along the A38 into Birmingham…I mean I know they've got cycle lanes which are on the pathway. But some of those have got blooming trees in and you have to go round trees. But I think anybody on a bike on that stretch of road, well I take my hat off to them because it's to me…because I know it's got a speed limit on it but people just tend to, because it can be a bit congested the minute there's a clear space they just put their

down and go. I just say I wouldn't like to be a cyclist in that area. For me to cycle on the roads, cycle lanes need to be totally separated from other road users" **(Participant 8).**

3) **Individually Designed Public Transport Services:** The findings collected from the travel diaries suggested individuals travelled for a variety of reasons (e.g. work or pleasure). Therefore public transport services should endeavour to meet the needs and requirements of a broad range of passengers. However what might benefit one individual could disbenefit another; for example, introducing cycle rack facilities on public transport might not be popular amongst all commuters, for instance, those who prefer a seat and do not cycle. A potential solution is that all public transport services should be individually designed based upon their travel routes and for the passengers that they are most likely to serve. Beirão and Sarsfield Cabral (2007) have previously proposed something similar. For example, if a public transport route incorporates either an airport terminal or a train station there might be a greater demand and requirement for additional storage; i.e. for baggage (refer to, participant 16). In turn, this may potentially promote a greater usage of alternative forms of transport and enhance travel experiences. However it might not be financially viable to have different buses or trains to accommodate different routes. On the other hand, research by Nelson et al. (2010) suggests economic viability in tailoring transport services, as this has become popular throughout some European Countries (e.g. Finland, Belgium and Netherlands). The transport services are described as Flexible Transport Services that provide services for the whole community, focusing on specific user groups, for example, the elderly, business individuals or manual workers, which in turn feeds into the conventional public transport network with the intention to enhance access and opportunities. These services are considered to play an essential role in the development of mainstream public transport services.

"I think our local trains there aren't any facilities for storing cases…we got the bus and there was nowhere of course to put our big cases, but we sat on the bus with our big cases...they don't cater for people with luggage, local trains and…well I don't think, even I can't remember, yes long distance trains do, but buses and trains don't cater for people with

luggage. It makes it worse because this bus actually starts from the airport. Until things change like they make adequate facilities to put my cases I wouldn't be coming back on the bus" **(Participant 16).**

4) **To reduce overcrowding:** Most prevalent at peak hours and discussed mainly by individuals who were under 65 and most likely to travel at peak hours. Henceforth, potential solutions to reduce overcrowding on public transport services should be focused towards peak hours. Participants proposed:

   - In total, eleven participants suggested increasing the number of train carriages particularly at peak hours. However it is worth recognising that it might not be financial viable to increase the number of carriages only for peak hours as this is unlikely to be unviable. This could result in an increase in fares, as additional costs might be incurred by the transport operators (e.g. purchasing new carriages). Furthermore, there is a potential that some current platforms are not long enough and would need to be extended. However, transport strategies which are implemented on some London Tube services could be adopted, such as when passengers are informed certain doors of the train will not open because the platform is too short.

   - Four participants suggested implementing standing-only zones inside of the carriages with limited seating similar to a London Tube train carriage. It should be recognised that this strategy might not be advantageous to everyone. For example, the elderly or disabled who might require a seat and therefore could result in them being less willing to use public transport services. However, as found from this research study and other studies they are most likely to travel at off-peak hours. However, this once again might confirm that transport strategies will potentially not have unanimous support.

   - All participants, regardless of age, suggested increasing the frequency of services (refer to policy 6). However if the number of services increased but passenger numbers remained constant, transport fares might need to

increase to cover additional costs. Furthermore, the questionnaire survey and initial interview discussions suggested that most individuals perceive transports costs to be too high and are opposed to increased fares. Therefore if fares increased this might reduce individual's willingness to use alternative forms of transport.

5) **Increase Segregation:** The participants (*n=15*) suggested there to be a need to implement more zoned spaces on public transport to potentially meet the needs and requirements of different passengers. For example, mobile free zones (Participant 11) or luggage zones, which would be secured with a personal coded to allow individuals to collect your belongings (Participants 10). The participants seemed to react favourably to increased segregation and the ability to store their personal belongs in a safe and secure area (e.g. Participant 6). In turn, this may potentially enhance individuals travel experiences and willingness to want to use alternative forms of transport. However if more designated spaces were provided (e.g. for luggage storage) this could act as a deterrent for people using public transport as levels of congestion on public transport might increase due to reduce availability of seating and space for passengers. It is worthwhile highlighting that this work has shown most individuals consider congestion to be a major deterrent for not using alternative forms of transport.

"Safe storage I think is really important, maybe a lock or a keypad or something that you can keep your storage in…the other option is you could have a check-in style service like they do on planes?" **(Participant 11).**

"I don't like is more often young people, though one doesn't like to stereotype, they're on these buses on their mobile phones very loudly swearing like billio and I just don't like it, shouting and all that. So I would say that that is a very big off-putting factor… Now you can't obviously do that on buses but I don't know why you couldn't do something like say if you want to be on your mobile phone you must go upstairs, or the back half of upstairs or something" **(Participant 10)**

"… it always seems to be on the movement and I think they do have the lockers in the stations so if you're going on from Birmingham and you wanted a quick look round Birmingham then you could…which we did in Edinburgh. We went to Edinburgh on the train and we were going round Edinburgh before we were going to a friend's we were staying with so the locker was there, so that was handy. I think in places like that, that's where you need it" **(Participant 6).**

6) **Frequency and Reliability:** From the observed sampled population, there was a sense that public transport was unreliable and irregular. In total, 67% of participants *(n=12)* suggested that a full money back guarantee should be introduced if a service was delayed by more than 10 minutes. This could be based on a trial basis of six months. According to the Guidance for Planning Bus Services, published in 2012, for Transport for London, if a bus service operates every twelve minutes it is considered by most as a 'turn up and go' service that is reliable; this in turn supports the local economy and expands opportunity for the local population (TFL, 2012). However as discussed throughout this chapter, public transport services are operated by private companies that are typically intent on profit. Therefore they might be unwilling to offer a full money back guarantee if a service were 10 minutes late. Typically, younger (under 25s) and older (over 65s) participants spoke of their frustration that public transport services do not run later into the evenings (i.e. until 00:00); or operate a minimum frequency of 15 minutes regardless of the day or time. This was despite most participants suggesting they felt unsafe travelling on public transport at night, as outlined below in measure 7. A potential solution for transport operators to meet punctuality targets could be to reduce the distance of the public transport routes (e.g. Participant 10). However if services operated later into the evenings and at the same frequency of day time hours, they might not operate at the profit discussed earlier in this chapter, as most individuals seem to have a preference for travelling in the day. Hence, there might be limited incentive by private companies, who are predominately the suppliers of transport services, to run later services if they are not financially viable. A further strategy to improve bus reliability was described by Furth and Muller (2000). Their work, based in Eindhoven, the

Netherlands, investigated giving priority to buses that were running late over those buses that were on time. This strategy was popular and found to be a strong method of improving bus reliability and confidence amongst users.

"Yes and my main advice really to these bus companies and to the city council would be – I really think they should shorten their routes. I understand why they have long routes for efficiency purposes, but I don't think many people are sitting on that bus from the Argy Green garage to Bartley Green and that is what is causing delays, or is a big factor in the delays" **(Participant 10).**

7) **Security Improvement:** Issues surrounding security seemed to be of great concern, particularly at night. Therefore, potential solutions to improve security should be primarily focused towards night time travel. Throughout the interview discussions, it was advocated the lack of unmanned stations or the apparent reduction of conductors were potential justifications as to why individuals felt unsafe and unwilling to use public transport services, particularly at night. It was recognised that this work had uncovered a potential willingness for people to want to use alternative forms of transport and potentially at night, but currently there is a perceived fear of public transport usage during night hours. Therefore to improve the perception of security, the participants proposed the following strategies:

   - Increase the number of conductors on public transport services to enforce travel regulations.

   - Decrease the number of unmanned train stations.

   However, if the number of conductors increased and the number of unmanned stations decreased potentially this might require more staff or more staff working at unsocial hours. It is typical for night workers to receive a higher rate of pay compared to day workers. Therefore if staffing levels increased this might potentially increase the overall staff wage, hypothetically resulting in an increase in fares or a reduction in services offered.

- Improved safety at public transport interchanges by clustering them together (i.e. bus and train stations terminals) with the aim to improve connectivity between alternative transport links, but to also improve security. However with the current austerity measures imposed by the central government in the UK, there might be limited political willingness to invest in transport terminals in order to potentially improve connectivity between alternative forms of transport, for example, increased cycle storage.

- Improve street lighting around public transport stations. Potentially this could increase the overall running costs of public transport services, thus making it less desirable for private companies to invest in such incentives as they aim to maximise their profits.

8) **Education of Transport Users:** Some interview participants (*n=7*) seemed to suggest that people required education concerning how to use the road in order to have a greater appreciation of other road users. For example, Participant 3 described experiences of witnessing both car drivers and cyclists ignoring the Highway Code, for example, jumping red lights or cutting one another up. Strategies to improve individuals travel attitudes and enhance road awareness between individuals included increased advertising (e.g. through TV, radio or billboard outlets), promotional days within schools, colleges and universities, or driver awareness courses similar to that of speeding courses, with a broad aim to disseminate the benefits of alternative forms of transport but to hypothetically improve aspects of road safety.

"I saw a cyclist yesterday, he just drove straight through the red lights and that doesn't endear cyclists to car drivers because they have to obey the rules of the road. There's a whole thing about rules of the road, but then until the rules of the road are enforced people are going to see if they can just get away with it. We've seen bad car driving and bad cycling…" **(Participant 3).**

9) **Highway design and investment:** Within the UK, The Highway network appears to favour car users over other road users (e.g. walkers and cyclist). For example, limited segregation between cyclists and car users, or inadequate cycle lanes that are too infrequent. This has previously been investigated and confirmed by Joshi et al. (2001) who explored the perceptions individuals have towards risk on the road network. Joshi et al. (2001) gathered the opinions of road users in Oxford, describing, exploring and evaluating individual's perceived travel perceptions. They found, primarily, individuals have negative preconceived ideas of either walking or cycling on the public highway. Of the sampled participants, some suggested in order to promote a greater usage of alternative forms of transport (e.g. cycling and public transport use) FTS could seek to adopt policies that prioritise alternative forms of transport over the car (refer to Participant 13). In turn this may potentially increase an individual's confidence and acceptance of using alternative forms of transport. For example, FTS may strive to actively disinvest in highways for the car (e.g. reduce road width in favour of more cycle lanes) in turn actively investing in highways for alternative forms of transport and therefore marginalising car users.

"…we liked Holland because you have cycle lanes and you felt safe… And also I think, okay it's a bit of a joke perhaps but even so, that they got more points on their licence if they knock a cyclist off, you know what I mean, you're a criminal. Here it seems to be how close you can get to the cyclist. But the problem also in the UK is there are potholes in the cycle lanes…they need to maintain the safe cycle lanes" ***(Participant 13).***

It was acknowledged that a limitation of collecting empirical research was the potential to gain an insight into individual's pre-conceived narratives or misconceptions concerning public transport in their area. This work focused on a sample population who were all considered to be car dependent therefore, the opinions of people who were not car dependent were not considered. For example, Hine and Scott (2000) found that the perception of public transport differed from regular users compared with people who were car dependent. This concurs with work by Aldred (2010) who investigated the perception of travelling to work by bike compared with car users or Steg (2005) who considered public

transport is often perceived as poor alternative when compared with car use as often the car is considered as a symbol of freedom and independence, a status symbol and the action of driving being pleasurable. The above research examples all concluded there to be many myths and false narratives surrounding public transport such as; crime levels, in particularly at night (i.e. often being lower than perceived), and the cost of public transport. However, the intention of this work was to focus specifically on individuals who were car dependent.

Furthermore, a principle objective of this research was to inform and to be informative to transport stakeholders (e.g. planners and policymakers and charitable campaigners). It was therefore considered necessary to engage with them. The intentions were not only to understand which of the above nine measures were more viable and practical, but also which were potentially more likely to be implemented in order to gain an insight into some of the potential barriers and obstacles that exist within the current public transport system in the UK. This in turn achieved **OBJECTIVES 3 & 4.**

5.4 Interview Interpretation: Local Transport Experts

A further five interviews were conducted with local transport experts. They included: a Transport and Connectivity Director who was responsible for promoting a greater usage in alternative forms of transport, at Birmingham City Council; Head of Sustainability; Technical Director (Transport for West Midlands); Road Safety and Management Director and; Regional Director, Charity. Initially, key transport organisations were chosen as this allowed for transport experts to be recruited from the identified organisations. Transport experts were recruited by either a personalised email, or by telephone (refer further to chapter 3, Section 3.8 for a further discussion regarding selecting interview participants).

It was the intention to gain a broad variety of transport experts in order to enhance the findings of this study. It was considered a wide variety of transport experts were represented from the local transport community, and therefore it was perceived that this study captured a broad variety of local transport expert's opinions. Additional transport groups were recognised, for example, the RAC Foundation, British Cycling or We are Cycling UK and the equine society. However, such groups often represent national transport

opinions and this study wanted to drill down into potential local travel issues and not national transport issues.

5.4.1 Potential Constraints towards Future Planning Strategies

All interviews started with a brief discussion of the findings of the questionnaire survey, travel diaries and previous interview discussions. In addition, transport experts were provided with a brief overview of the research study and the purpose of the interview. Local transport experts discussed a range of practicalities or barriers that might arise if the theoretical FTS and measures were developed (FTS were based upon previous research). However, it is important to recognise that all five transport experts accepted (regardless of their professional background e.g. private or public based sectors) the need to promote a greater usage of alternative forms of transport through new transport strategies. Typical responses gained are shown below:

"It's a balancing act and it's not easy…we know more needs to be done and we are determined to get there… So it's going to take time" ***(Transport and Connectivity Director, Council).***

"In Birmingham I think that there has been a series of missed opportunity in particular around walking because I think that walking from a health point of view has got a lot of potential. I think that walking is one of those things were we could and should be doing a lot more. There's a fascinating statistic that Birmingham Connected talked about which is in Birmingham there are 250,000 car trips every day that are under one mile" ***(Regional Director, Charity).***

A broad range of discussions were held with the five transport experts. In total, eight theoretical transport planning barriers or practicalities were unearthed from the interview discussions with local transport experts that might impede the development of FTS, and each are discussed in turn below:

1) **Financial Implications towards implementing new transport policy**: This was recognised to be a major barrier of FTS. Some experts often discussed the need to have economic creditability and a business case before conceiving or developing FTS (e.g. Transport and Connectivity Director, Council and Technical Director). On the

other hand, this was not reflected throughout all the interview discussions. For example, a Charity Director focused on passenger's experiences to be the most critical aspect rather than financial implications, as discussed by the Council Director. This highlights a possible conflict of opinion that might exist between transport experts, but also the different parameters that transport experts might determine as critical to promote a greater usage of alternative forms of transport.

"All transport networks require you to put together a business case, which is where the funding comes" ***(Transport and Connectivity Director, Council)***

"It's not always about an economic case but it must be considered. You can't just allocate space willy nilly without understanding that there are going to be consequences of that and it's the cities and so on need to understand what those consequences are and then sign up to accepting them or not as the case may be" ***(Technical Director)***

"All trains I get on are over crowed practically at peak hours. So actually why isn't there a six carriage train on all the time?" ***(Regional Director, Charity)***

2) **Public perception:** One interviewee (Technical Director) suggested that the public had a misconception regarding public transport referring specifically to fares or security. On the other hand, the Road Safety and Management Director did not concur and suggested public transport fares were too expensive and sympathised with the public's view. For example, the Road Safety and Management Director accepted advance tickets are typically cheaper, but stated rarely do people plan their journeys and are often unsure where and when they might need to be at specific times throughout a given day. The contrast in opinions between the sampled transport experts reaffirmed the differences or agendas that might be embedded across different transport experts regarding how they might influence travel patterns in order to favour a greater usage of alternative forms of transport.

"I still maintain that cost on public transport is a perception issue because people don't understand the type of tickets they can actually get, because they don't take the time or they don't even look… So yes, I mean security and the feeling of security and the perception of security needs to improve massively and the buses have got a fairly negative image in

Birmingham…People put up costs more often than in my experience, people put costs and say well why should I pay this when I've got my car and it's free and that is a complete misconception and misperception about your car being free… I don't think cost is an issue" ***(Technical Director)***

"I've seen people in peak hour queues at railway stations come to the front of the queue, attempt to buy a ticket for a train to London and then walk away from the queue because they're not going to buy a ticket at that price…So yes, the price is definitely an issue and then if you try and buy things in advance then you do…and I try to do that as much as I can personally both for business and leisure, but if you start doing that then obviously you've got to plan journeys more" ***(Road Safety and Management Director).***

3) **Simplified Ticketing Systems:** Four out of the five experts accepted that the current ticketing system in Birmingham is convoluted, requires modernisation and needs to become user friendly (e.g. Head of Sustainability). Some transport experts suggested future transport solutions should offer a service that allows travellers to easily and quickly calculate their cheapest options. It was advocated the introduction of the Swift card would be one solution to make ticketing simpler for passengers (Transport and Connectivity Director, Council). The Swift card is similar to the Oyster card and has been implemented on some transport services in West Midlands during 2016. However other experts were more sceptical regarding the implementation of the Swift card, as they suggested it is something they have heard a lot about but seen limited evidence of it having an impact on improving alternative transport usage, or changing individuals travel attitudes and behaviour (Regional Director, Charity). It is worthwhile to highlight the responses gained from the transport experts might not reflect their personal opinion, rather more their professional interests. For example, the Swift Card is promoted by Birmingham City Council and therefore it is unlikely an employee of the Council would suggest this to be a negative travel incentive. However, this research has clearly identified that most transport experts appeared to agree there is a need for new transport policy in Birmingham, UK – this especially unearths new research findings as no research study has specifically focused on this area of Birmingham from the perspective of individuals who are car dependent, and reinforces the importance of this research study. Furthermore, it concurs well with

previous research, which suggested transport policies are failing to meet the travel needs and demands of individuals (Lucas, 2012; Hoogma, 2002 & Banister, 2001). Therefore the findings of this work might be instrumental from a local transport research and practitioners perspective, as FTS have been explored to influence the travel habits and attitudes who have a preference for car travel.

"The current system of pricing probably needs simplifying and our response to that I guess is we've been working on a Swift card, a Smartcard system and we would like to see flexible pricing as part of that and sort of based on, effectively based on the London model. So a capped fare which the customer doesn't have to worry about and work out" (***Head of Sustainability)***

"In the West Midlands, it's called Swift, it only operates at the moment on the bus network and it really only facilitates concessionary passes, so OAP passes, week and month and annual passes and school children and so on. But there isn't really any mechanism which I refer to as same as your mobile phone, as pay as you go, so as a consumer of transport you don't know from day to day how you're going to choose to travel… at the moment the Swift card doesn't do a pay as you go, which makes it very difficult, you'd get charged maximum for every time you hopped on and hopped off a bus, so that is a barrier I think for people having that transport accessible because of the cost of it". ***(Transport and Connectivity Director, Council)***

"We don't have integrated ticketing, we heard Swift card talked about forever and a day, we have got deregulated buses, so actually I think it's kind of a bit of a mess really" ***(Regional Director, Charity).***

4) **Political Willingness to Fund Alternative Transport Incentives:** Despite what appeared to be a willingness amongst transport experts to promote alternative forms of transport (e.g. Transport and Connectivity Director, Council and Head of Sustainability). All five of the transport experts intimated there to be a current lack of political willingness at the national level to promote alternative forms of transport (e.g. Regional Director, Charity, Head of Sustainability and Road Safety and Management Director). This indicates the potential broad synopsis towards the

development of FTS. Despite transport experts previously appearing to disagree with the development of strategies (e.g. pricing), political willingness seemed to be an avenue of agreement. The lack of political willingness towards funding alternative forms of transport is also supported by reviewing current transport strategy, which appears to favour road infrastructure projects to benefit car use. For example, Highways England Delivery Plan 2015 – 2020 and the introduction of the first Road Investment strategy (RIS), which are a range of financial measures worth over £15 billion between 2015 – 2021 towards the strategic road network in the UK (DfT, 2015). On the other hand, it is acknowledged there are a number of funds which attempt to promote a greater usage towards alternative forms of transport. For example, the Sustainable Travel Fund or the Cycling, Safety and Integration Designated Fund. However, it is typical that alternative transport funds, for example cycling funds, receive limited funding in comparison to road investments for the car (DfT, 2016). This concurs well with broader discussions by Aldred (2016) who implies alternative transport funds are typically undervalued and poorly financed and understood by national and local governments.

"So what we've got is the cycle revolution which I mentioned earlier and the ambition, because we've got very, very low levels of cycling here in the city and we've set ourselves a very stretching target by 2031 is to have 10% of commuter journeys by cycling" ***(Transport and Connectivity Director, Council).***

"At the moment we've got a 1% cycling level in the West Midlands. That hasn't changed an awful lot in the last 10 years, there's a slight increase in cycling in Birmingham and Coventry, there have been slight decreases in the other districts, and there's been some stability at Solihull as well. But if you want to get to…what we should be aiming for is a 5% enabled share of all journeys by 2023" ***(Head of Sustainability).***

"And the elephant in the room is the fact that actually it is really, really easy to drive around the city and actually congestion is not…it hasn't got to peak yet. I mean you

notice it…I mean the morning rush hour peak is quite a small peak" ***(Regional Director, Charity)***.

"So we were just talking about cycling, so effectively we've got a Cycle Charter Action Plan and that sets out a number of things that we need to do to increase cycling levels and that talks about leadership, about promotion. It talks about the need for a continual investment in cycling rather than sort of stop/start provision" ***(Head of Sustainability)***.

"And in London on the cycle super highways TFL are now sacrificing traffic lanes for segregated cycle lanes. So it can be done, it's just whether the local authority, the highway authority has the political will to do it" ***(Road Safety and Management Director)***.

5) **Educating Transport Users:** Educating transport users about the benefits of using alternative forms of transport were acknowledged to be important. The Road Safety and Management Director highlighted, for example, the importance of regional champions to reduce car use. However the Head of Sustainability highlighted current transport strategies exist to promote the importance of road awareness. Once again, this highlights the conflict amongst transport experts. On the one hand, some experts suggested transport education is being achieved (e.g. Head of Sustainability), whereas other experts suggested more transport education would be beneficial (e.g. Road Safety and Management Director). Consideration should be given to the professional agendas that might exist amongst transport experts. For example, if one transport expert benefits from providing regional travel champions, or does not have to work within budget constraints, they might favour introducing regional champions. Road awareness is acknowledged to be a key element in increasing the uptake in alternative forms of transport, for example, promoting cycle usage has been implemented through a variety of methods, such as travel plans, separated cycle lanes (i.e. green lanes) and cycle awareness programmes (e.g. maintenance courses) (Pucher & Buehler, 2008; Wegman et al. 2012; Dickinson et al. 2003). A

further example of attempting to improve safety and awareness can be found in the City of Sheffield, which introduced a 20mph speed restricted zones around all on road cycle lanes. The importance of reducing speed restrictions in urban environments to encourage a greater usage of alternative forms of transport has been well established (Aldred and Woodcock, 2008; Cairns et al. 2015 & Taeihagh et al. 2013). However, despite well researched and proven measures to promote safer and alternative transport routes, there is still a sense of opinion amongst some transport experts and the sampled population of this research that more needs to be done to promote alternative forms of transport as a safe and effective mode of transport. The below responses explicitly address how a specific area of the UK (Birmingham) might address this problem.

"I think regional transport champions are the key. I think they are the answer your question I think there's an enormous amount more that we could do" (***Road Safety and Management Director)***.

"It is really crucial we do some promotion of cycling and that does cost some money and we do that in a number of ways. We work with our partners as well like in the local authority we work with third sector organisations like Sustrans and Living Streets. We're going into schools looking at travel planning for schools and colleges and universities. We're doing work with companies that represent over 100,000 employees, so looking at helping them and support them by becoming top cycling and walking locations" ***(Head of Sustainability)***

6) **Privatisation of the Transport Network:** All transport experts unanimously suggested and agreed that the privatisation of transport networks, for example, train services, has made it more difficult for planners and policymakers to influence modal change; either at a national or local level, as it has become highly complex. They suggested private companies appear to be more interested in profit margins rather than customer experience, particularly referring to the disjointed operation of the transport network. However, it is worth noting that renationalising public transport services is considered by most as a popular policy in the UK, with 66% support

(YouGov, 2015), it is unlikely that this will occur in a period of economic and political uncertainty. However, perhaps transport experts need to especially address the needs of their local communities to be able to work with privatised transport operators and this work may enable this.

"What you've got at the moment is train companies that are all separated and split up. This makes it difficult for the commuter but also planners. Private companies are only interested in their shareholders" ***(Road Safety and Management Director).***

7) **Tailored Transport Services:** Four out of the five transport experts said they frequently discussed the design of the transport services with the aim of improving the passenger's experience. It was suggested travel operators favour refurbishing rather than buying new stock (e.g. train carriages). It was recognised future travel design may also have potential benefits for alleviating overcrowding, for example, implementing standing only areas. In addition, the length of the journey was considered as it was suggested passengers have different travel expectations depending on the journey length (e.g. Head of Sustainability). However, there is no doubt the viability of providing tailored services will have to be explored as it is illogical to only have certain trains, buses or trams which can only be used for certain routes as this will inevitably increase fares as transport organisation will have to increase their rolling stock to cater for different journeys. Increasing fares has been found from this work and other studies to be an unpopular decision. On the other hand, if issues such as congestion and reliability are improved, which have also been highlighted in this work, to detract people from using public transport, some individuals might be prepared to pay more for their journey. For example, some individuals are prepared to pay more money for first class travel for the same journey. Although this could potentially isolate, segregate and divide communities.

"I think yes standing…yes that would probably work and I would well imagine that the next generation of trains that they put on there…because the problem with them is that the rolling stock costs so much that they don't invest in it very often and it's cheaper for them to quite often to refurbish it and get it back out there than it is to go and buy a whole new train carriage" ***(Technical Director).***

"Well that's the other thing, is to look at capacity within those and say on very short urban journeys how do you actually use the space inside the carriage and are there things we could do with that. It would be okay for quite short journeys but it seems that they become…and I forget there is a figure for the number of minutes…if it becomes over certain minutes, then people expect them to have a seat and be able use that time as well… Also longer journey you do your emails, you work, you read, you nap or whatever you do, but you use that time, it's no longer dead time for most people" ***(Head of Sustainability).***

8) **Reliability and Later Services:** All transport experts acknowledged that reliability and frequency are critical to enhance passenger numbers, and in turn this highlighted their continued commitment to seek improvements in public transport services. For example, three experts suggested weekend or later evening services were required. However, it was recognised that these services would potentially require additional funding. Some experts suggested this could be provided by central government (however this was considered unlikely in a time of austerity), increased passenger fares or that a pilot (i.e. trial) weekend services have seemed popular and might be lucrative and profitable for transport operators. In addition, applying for refunds (if a service is delayed) should become simpler and easier. The Head of Sustainability suggested refunding passengers is too complex and should become automated, where possible. However as discussed, typically most public transport services are operated by private companies and hence they may be unwilling to make it easier for commuters to receive or apply for refunds as the result of delayed services because they want to maximise their profits.

"Later services to support the night time economy both on buses and rail as well so that people have got choices, we want them to come to the Barclaycard Arena, Symphony Hall in the city centre and enjoy Birmingham's attractions." ***(Transport and Connectivity Director, Council)***

"Yes they're all great ideas, but someone has got to pay for them, there's no solution to that really, it either becomes 10 quid a fair to get the bus home at 2 o'clock in the morning because that's the true cost of it, or everybody's fair has to go up. Or in some way then more subsidy has to be paid in which case what we're all going to pay more taxes or those

taxes that we do pay are going to get spent in different areas? So yes that's a great idea, yes I think we should definitely run later and more frequent services of an evening and so on and it would definitely help a lot of people to make different choices, but it's got to be paid for." ***(Technical Director)***

"We have been trialling different types of bus services like the Platinum buses on those specific corridors and we are seeing passenger increases. If we run later services which are attractable to the passenger they might be profitable" **(Road Safety and Management Director).**

"This is a personal view, I think that the rail reimbursement if things go wrong is quite complex and if you can…but this being addressed at the moment, people are giving some thought to this within the rail industry. Because customers actually expect either an automatic refund or some very easy way of doing an online…you know claiming back online if the performance isn't met…. I think the late night service one is an important one too, some of the networks we've got in the West Midlands is very well covered by the rail network and actually until quite late in the evening, but some of the inner city connections are very poor in the evening. A service for instance if somebody is coming from where I come from in Cheltenham to…or if they come from the South West to Birmingham to see an event they can't get back again." ***(Transport and Connectivity Director, Council)***

The discussions held with the transport experts provided a useful insight into the current barriers towards promoting sustainable transport strategies along a specific travel corridor in Birmingham. Firstly, all experts agreed more should be done to promote a greater usage of public transport, but a fundamental limitation of public transport in the UK is that it is regulated by the private sector. Therefore services are driven by profit rather than focused towards providing a service. It was suggested a major obstacle was that planners and policymakers were limited in implementing the transport strategies that they most desired, and on the whole, most experts agreed that the current ticketing system in the West Midlands could be simplified and acknowledged that the reliability and frequency of public transport services are inadequate. In the main, transport experts agreed services needed to become tailored to the user and this work has identified potential strategies to achieve this. Finally, it was considered there to be many pre-conceived misconceptions

relating to public transport, however transport experts were not unanimous in how to promote transport strategies in the future in order to reduce car usage. For example, some experts felt public fares were reasonable and others did not concur.

5.5 Chapter Conclusions

This chapter has investigated and analysed the findings from the travel diaries and interviews. The main intention of the travel diaries were to gain an insight into the travel patterns of individuals over seven consecutive days, and for the interviews to gain a further detailed understanding regarding the potential practicalities and barriers of implementing FTS from a local transport perspective. All of the FTS that were initially discussed throughout the interviews were based on the findings from the questionnaires. The main conclusions from each research method are now described in turn below.

5.5.1 Travel Diaries

The sample population indicated the main purposes for their car trips were for employment, leisure or shopping activities. The findings indicated that their car use was predominantly affected by age, for example, no participants over 65 indicated they used their car for employment - concurring well with the questionnaire findings. However, this was a potential limitation of this survey as there is no legal retirement age in the UK, and this study recognises there are still people who are over the age of 65 who are employed – but this was not captured in this study. This might indicate that further research is required to capture those individuals who are car dependent but still employed, which in turn would gain an insight into this specific group of travel attitudes and behaviours.

It was revealed participants aged 25 - 65 made the greatest number of daily car trips compared to those who were under 25 or over 65 who made fewer car trips. Interestingly, most participants indicated that their car trips were regulated by the time of day, for example, the majority of over 65s travelled at off-peak rather than peak hours. Despite it being acknowledged that old people (i.e. over 65) typically travel at off-peak hours, the variation between when people are most likely travel (by age) was not expected, as all participants were considered to be car dependent and thus is was anticipated limited variation between ages would be found. The findings of this work are therefore a clear indication to reinforce the idea that travel strategies need to be regulated by age and time.

Travel strategies are currently targeted by different hours (i.e. peak and off-peak times) but not specific social groups within society, for example the most car dependent people, and this research might allow planners and policymakers to target specific policies towards them.

A further key finding from this work was that most of the sampled participants underestimated their trip costs (*n=16*) and some participants emphatically refused to accepted that their car cost were actually higher than what they perceived. This related well with similar research (e.g. Beirão and Cabral et al. 2007 and Hine and Scott, 2000) however this was anticipated as the sampled participants were known to have a preference towards car travel and therefore might enjoy and prefer travelling by car.

It is worthwhile to note that this research sampled a specific group of car users along a travel corridor in Birmingham, UK and this presents a potential limitation of this work. Nevertheless, this work provides a useful insight for local transport planners and policymakers based on specific travel group. Further research might benefit from confirming if all commuters in Birmingham, UK and along this specific travel have similar travel perceptions. For example, it is logical to assume, commuters who pay either on a daily, or weekly basis (e.g. daily or weekly bus and rail passes) are more likely to have a good awareness of their travel costs compared to commuters who pay on an infrequent basis.

5.5.2 Interviews

After all the participants had completed their personalised travel diaries and had returned them to the researcher, each participant was invited to take part in a follow up interview at a time of their convenience and a location of their choice. In total, eighteen follow up interviews were conducted (based upon participants from the travel diary survey) and a further five interviews were conducted with local transport experts to explore the practicalities and barriers that might exist towards implementing the proposed FTS.

It was acknowledged that the sampled population was a relatively small sample size and that this was a potential limitation of this study. However, this allowed for a detailed level of personalised information to be obtained from each participant regarding their travel attitudes and behaviour. Additional participants were available upon request, if required by the researcher. Each interview consisted of the interviewee and interviewer in order to limit

potential conflict and disagreement amongst the sampled participants, but also it was recognised individuals were describing their personal travel opinions and may not want to share it with other participants.

The initial eighteen interviewees were asked to discuss potential problems or issues they felt currently existed with alternative forms of transport, in order to inform FTS of potential strategies to reduce car use. The participants discussed a range of issues and justifications as to why they did not want to use, or did not use alternative forms of transport. This work unearthed financial incentives, segregated cycles lanes, individually designed public transport services, overcrowding, and increased segregation, frequency and reliability, security improvements, education, highway design and investment as potential barriers and obstacles for the sampled population to prefer their car over alternative forms of transport. All nine identified justifications have been well researched throughout previous research. However, unlike previous studies, this work has predominantly focused on individuals who are car dependent, and gained an insight into their opinion.

A key finding of this study was that individuals were in favour of cheaper public transport and there was a lack of support for different travel fares throughout the day (i.e. peak and off-peak fares). This is not a new transport policy as many studies have found peak charging to be unpopular (e.g. Rotaris et al., 2010 and Banister, 2003). However, unlike previous research, which has often suggested potentially shortening or increasing peak chargeable hours, this research study uncovered an alternative approach. It was suggested by participant 15 to reverse the charging of peak and off-peak hours; therefore to make peak hours cheaper to travel than off-peak hours.

A further encouraging finding from this work was that most of the sampled population indicated a preference to travel by alternative forms of transport in urban environments - London was frequently described as the utopian environment for wanting to use public transport. This presents an interesting finding that suggests current transport strategies, especially within Birmingham, are not meeting the needs of those individuals who are car dependent and there are insufficient incentives to encourage them to shift their modal patterns. The findings observed that some participants were willing to change their travel habits in favour of alternative forms of transport when travelling in similar urban

environments to Birmingham, for example, London. However it was unknown if the sampled population were more likely to prefer travelling to an urban environment they are unfamiliar with by car or alternative forms of transport. This is currently unclear from this research study and presents an opportunity for future research.

Furthermore, the findings from this study identified that not all of the above transport strategies discussed throughout this chapter had relevance to each participant. For example, 64% of participants (*n=4*) over the age of 65 indicated a preference towards more policing on public transport services compared to 16% of participants (*n=1)* who were aged 25–65. This resulted in different discussions between participants regarding how this policy could be implemented. In the main, participants over 65 (*n=5*) suggested a preferred preference for an increase in visual presences of officers (e.g. train guards), whereas this was not perceived as a priority for participants aged 25-65. Despite this recommendation from this study, it is highly unlikely that implementing more conductors on trains will become a reality, as some train operators, if not most, intend to implement driverless trains (similar to some London underground trains, for example, Docklands Light Railway) and ticket barriers to automatically check passengers tickets, thus this recommendation directly contrasts to current transport policy.

In order to gain an understanding into how realistic and practical some of the FTS were, a further five interviews were then conducted with transport experts in order to determine the practicalities and barriers that might exist towards the proposed FTS and measures. In general, the sampled transport experts accepted more needs to be done to promote a greater usage in alternative forms of transport. In total, eight potential transport planning barriers and areas were identified, which had a specific reference towards Birmingham, UK. They were: financial implications, public perception, ticketing, political willingness, education, privatisation of the transport network, tailored transport services, reliability and later services. It is currently unknown of any other research study that has specially focused on this travel corridor of Birmingham, however, this study has not sought to compare how the identified FTS could influence the travel attitudes and behaviour of car dependent individuals in other urban environments. Therefore, it was considered logical to exploit and investigate the views of local transport experts. Future research would benefit from comparing the findings of this study to a comparable study, which attempted to

understand travel behaviour in a similar urban environment. It is important to recognise not every transport expert shared the same opinion regarding FTS and therefore this might reflect conflict between transport experts regarding the implementation of FTS. This justifies further the importance of conducting face-to-face interviews and not focus groups between transport experts, as there might have been animosity between them.

The findings from the interviews indicated the need for FTS to become tailored towards different demographic characteristics and therefore resonates the importance of stakeholder engagement for transport planners and policymakers – this work is an example of stakeholder engagement. However, it would have been worthwhile for this research to investigate how much participants would have been willing to pay for the implementation of a specific strategy. This approach has been widely used across transport studies and other research fields such as health to determine customer satisfaction (e.g. Olsen and Smith, 2001; Homburg et al. 2005 & Li et al. 2010). Further research would benefit from adopting a willingness to pay approach method based on the strategies in this work.

Finally, a potential limitation of this work was that no interview took place with a transport operator who the hypothetical strategies would most likely affect. Transport operators were contacted but they declined to take part in this research. On the other hand, TfWM engaged in this work, and they are responsible for providing transport franchises throughout the West Midlands. Chapter 6, the next chapter, attempts to discuss the results collected for the purpose of this research. Chapter 6 also provides a useful insight for transport stakeholders by outlining future lessons.

Chapter 6

Chapter 6: Research Discussion

6.1 Introduction

The aim of this chapter is to present the key findings that were collected for this research study from each of the individual research methods. For the purpose of this study, a significant and extensive range of data have been collected from a wide range of transport stakeholders, including members of the public, transport consultants, policymakers and charitable organisations. The stakeholders were chosen for their interest in the local area of the case studies.

This research study was based upon a mixed methods approach that included three individual methods: questionnaires, travel diaries and interviews. All three methods were important to this research study as they contributed individually, and as a whole, to the overall study. Each research method and their key findings are each discussed sequentially throughout this chapter. The main aim of this study was to investigate the practicalities and constraints that might exist towards reducing car dependence of individuals who had been recognised to have a strong affiliation to the car (refer further to Chapter 1, Section 1.3 regarding the aims and objectives of this study). This chapter is structured into three main key sections:

1. ***Review of the Methods***
2. ***Research Discussion***
3. ***Recommendations for Transport Stakeholders***

6.2 Review of the Methods

6.2.1 Overview

The next section of this chapter outlines some of the benefits and limitations of each method and discusses the lessons learnt from each method to inform future studies.

A benefit of using a mixed methods approach for this research was that each method provided the opportunity to adapt, change and reflect based on the findings of each method. For example, if the researcher felt a travel attitude or habit needed additional investigation there was opportunity for this to be achieved. This allowed the researcher an opportunity for reflection, which enabled the lessons learnt from each method to be

implemented. Furthermore, from an initial review of the literature, it was recognised that some participants might attempt to please the researcher, which often occurs when investigating travel habits and attitudes (refer to Chapter, Section 3.2). Thereby, adopting a mixed methods approach provided the researcher with the opportunity to investigate, question and analyse participants over a greater period, thus allowing for validation and comparability of participants responses. Teddlie & Yu (2007) further discusses the importance of comparability throughout research studies.

It was accepted, like all methodological approaches, there were a number of potential limitations. For example, it was accepted that some participants might not be willing to take part in a research study conducted over a period of approximately one year. A further constraint could be that an individual of the sampled population might move from one area to another and therefore would not be able to participate in this study, as they no longer would live along the selected travel corridor. However no individual from the sampled population moved their residency throughout the study period.

All participants who took part in further research (e.g. travel diaries and interviews) were sent a personalised email to confirm that they were willing to take part in additional research, and reminded of their right to withdraw at any time. This approach was considered the most logical, as the intention was to ensure every participant was content with taking part in the research study. Furthermore, it was thought this approach would allow for further detailed information to be gained from each participant, as they had agreed to take part in further research, and it is logical to assume they would be more willing to engage with the researcher.

6.2.2 Limitations of Questionnaires

This approach of sending personalised emails was not used throughout the questionnaire, as personal contact details were not known when the questionnaires were distributed. However, future research might benefit from the researcher knocking on doors to ask household residents directly if they would be willing to take part in the research study, which might achieve a greater response rate. However, the method conducted for this work achieved a response rate of 13%, typical of a postal survey (refer further to Chapter 4, Section 4.3). However, despite each deprivation area receiving the same number

of questionnaire surveys (300 questionnaire surveys) fewer people participated in the questionnaire survey from more deprived areas. This was a potential limitation of this work. Future work therefore could benefit from distributing more questionnaires to areas that have a higher deprivation level in order to achieve less variation between different deprivation levels.

The questionnaire was recognised to be targeted towards a general audience, and this was one of the intentions and objects of the survey (e.g. **OBJECTIVE 1**). On the other hand, this was also a potential limitation. There was a risk that the responses might be skewed towards a specific age range, or completed by individuals who typically used alternative forms of transport for their daily travel trips, as the questionnaire did not specify which household member should complete the questionnaire. Despite this, it was considered this gained a holistic understanding into travel habits and attitudes along a specific travel corridor, and it was envisaged further research (i.e. travel diaries and interviews) would be targeted towards individuals who were identified to be the most car dependent. However, all participants of the questionnaire were car drivers, as a criterion of the questionnaire was that all participants were required to hold a Full UK driving licence and therefore had some level of dependence on the car.

Further work might benefit from adopting a similar approach to this research study, but implementing two key lessons. (1) Target households who own a car; (2) as previously discussed in Chapter 1, Section 1.2 car dependency is a subjective term and can be widely interpreted. Future research therefore might benefit from including an example of car dependency in order to provide clarity for the sampled population, as car dependency could also be associated with aspects such as health or geographical characteristics. It is worthwhile to note all participants of the travel diaries and interviews were briefed on the definition of car dependency and this provides an example of how lessons were learnt throughout this work.

6.2.3 Potential Travel diary and Interview limitations

The personalised travel diaries and interviews were analysed in one concise chapter (Chapter 5) as they were conducted with participants throughout the same period (i.e. the

same month) and were heavily reliant upon one another, for example, individual's specific travel trip.

A potential limitation of the personalised travel diaries was that they were personalised and only gained the opinion of one participant, the car driver. A potential area of future research might be to attempt to investigate passengers' travel experiences in order to gain some understanding of their travel preferences. However, as this research was specifically targeted towards car drivers, it was considered worthwhile to only investigate their travel habits and attitudes. Furthermore, this work was required to be conducted within constraints (e.g. financial and ethical). However it is acknowledged that some participants may have been willing to take part for no financial reward, although it is typical for surveys to provide some form of incentives (e.g. vouchers) in order to encourage individuals to participate.

A further limitation of the travel diaries might have been that participants were only required to manually transcribe their travel trips – similar to a traditional diary. However, it might have been worthwhile to ask them to visually document their trips as well, for example, by using a disposable camera or a GoPro. This might have provided the participants the opportunity to annotate images of the current road infrastructure to depict how current road infrastructure might be improved in order to change their preference towards preferring alternative forms of transport. However, this approach might encourage some participants to take pictures or be distracted whilst driving and this could endanger themselves or other road users. In contrast, all participants were shown imaginary scenarios of how future road infrastructure might look and interact in the future (e.g. signalised junctions that within the next 30 years), and were asked to discuss how each scenario might influence their current dependency towards the car. This allowed the participants the opportunity to describe aspects that they preferred or disliked. Also, it provided the opportunity to reflect on their own personal travel experiences (with specific reference to the travel week that they had documented) in order to discuss how certain travel measures could be implemented that might encourage them to reduce their car use, achieving **OBJECTIVES 1, 2 & 4.**

All interviews were conducted on a face-to-face basis, which allowed for a detailed and personal insight into the individual's travel habits and attitudes or understanding of travel policy to be gained. A number of limitations have already been discussed throughout Chapter 5 regarding face-to-face interview discussions. Hosting a number of workshops might have been useful tool in order to inform FTS, however this approach was not done, as it was recognised some of the travel experts represented private, public and local organisations, and therefore potential conflicts between them and the participants of the travel diaries might have evolved. It was therefore considered that the most logical approach was to use personalised face-to-face semi-structured interviews to avoid potential areas of conflict and animosity between different groups of the sampled population.

6.3 Research Discussion

6.3.1 Questionnaire Surveys

The questionnaire survey sought to compare and understand the influence urban demographic characteristics might have towards individuals' car use, with the intent of informing future transport strategies (FTS). This research focused on three demographic characteristics: age, gender and deprivation. All three characteristics were acknowledged and chosen as they were shown to have the ability to influence individuals' car use (refer to Chapter 2, for example Section 2.3 for further detailed discussion).

Initially, the questionnaire survey indicated that 90% of the sampled participants were highly dependent on the car for their daily travel trips. It was critical that the sampled individuals suggested they had a high car dependency and preference for car use, as the overarching research aim of this work was to investigate theoretical transport strategies that could reduce the car use of individuals who were heavily car dependent. It was unsurprising that the findings highlighted most participants had a strong association towards their car as this study was particularly and deliberately skewed towards investigating groups of people we were recognised to have a strong car use. Previous research has suggested that most societies are becoming more dependent and orientated on the car. This was further confirmed by Lucas and Jones (2009) who describe how the popularity of the car has grown in less deprived areas, especially amongst women, where previously, alternative forms of transport such as walking or public transport were the chosen travel option.

Despite recognising, the sampled population had a strong car affiliation. Two thirds suggested that they were aware of the potential effect that their car behaviour might have on the environment, for example, climate change. This began to advocate how individuals might prioritise their actions, for example, how their cognitive actions might contrast to their daily actions. Furthermore, most of the sampled population recognised the potential negative effects car dependency might have on climate change, but still indicated a preference towards the car for their daily travel use. This could suggest environmental concerns are prioritised less than other issues, such as health or economic factors. As previously outlined in Chapter 2, Section 2.3, Steg (2005) demonstrated that the car is perceived as a status symbol of power, strength or wealth. This in turn continues to justify further why individuals might have a strong car dependency. Therefore, if the car is perceived by some as a symbol of wealth, it might be reasonable to expect individuals within the UK to have a high car dependency, as they might be intent on demonstrating and signifying their wealth and status. Bursztyn & Jensen (2015) further describe the association between peer pressure and social attitude.

Although participants suggested an initial preference and stubbornness to car usage, encouragingly the sampled population showed a willingness to reduce their car use in favour of alternative forms of transport. For example, 63% of the participants predicted their car use would decrease within 15 years. However, it should be noted that how participants might respond to a questionnaire that attempted to understand how to reduce car their use, could be different from their daily actions when they are not taking part in a survey. For example, how participants might actually travel on a given day after responding to the questionnaire could be different to how they responded in this research. A potential solution to limit this would be to resurvey participants, for example, a month or year later to compare if their travel behaviour and attitudes had changed. However, the scope of this research did not allow this to take place due to financial and practical constraints. Hence, the responses gained from this study could be an example of how participants attempted to satisfy the research study, by responding to the questions in order to please the researcher.

A potential example of how participants might have attempted to satisfy the questionnaire survey was that no participant indicated they predicted their car use to decrease because of environmental reasons, despite two thirds of the sampled population

acknowledging the environmental impacts of their travel attitudes. Kennedy et al. (2003) considered further how participants might attempt to satisfy research studies. In the main, they found women tend to share and open up more regarding their thoughts and feelings compared to men. This concurs well with other studies by Davis et al. (2015) or Pierce et al. (2012) that suggest it is typical for a sampled population to attempt to satisfy a research study. However, as this study was designed and developed based upon a mixed methods approach, the findings were continually validated throughout the study in order to mitigate some of the hypothetical limitations as outlined above. For example, the interviews allowed the researcher to investigate further participants' specific responses from the questionnaire survey and travel diaries. This therefore further illustrates and verifies the importance and benefit of conducting a mixed methods approach.

Throughout the questionnaire demographic characteristics were continually investigated to determine the potential influence they might have on individuals' car use. The questionnaire survey continually demonstrated age to be the only characteristic to have a significant relationship with car use. For example, age was the only demographic characteristic to indicate a significant relationship at the 99.9% confidence level ($p<0.001$) when compared to car use. The influence of age was further reconfirmed when analysed against eighteen hypothetical FTS (in section three of the questionnaire survey). Once again, age was the only demographic characteristic to demonstrate a significant relationship with influence car use ($p=0.018$). The three most effective FTS that were identified to have the greatest potential to reduce an individual's car use were:

1) Public transport fares decreased by 25% (2.1 average score in relation to car reduction).

2) Congestion charge (similar to that of a London congestion charge) was implemented at £5 per day but cycle lanes and public transport facilities were commonly available (2.2 average score in relation to car reduction).

3) No change to your commuting distance but access to public transport and cycle lanes were commonly available i.e. bus stops were within a 500 metre radius (2.3 average score in relation to car reduction).

Based upon the questionnaire findings age was found to be the most critical urban characteristic when developing FTS, from the three characteristics investigated for the purpose of this work. The findings from the questionnaire suggested some commonality with previous transport research. For example, Kuhnimhof et al. (2012) investigated the car use attitudes of adults in Germany and found that younger adults were more likely to reduce their car use than older adults. Furthermore, other research has shown similar findings when comparing the relationship between age and car use (e.g. Steg 2005; Bamberg et al., 2003). In addition, Davis et al. (2012) considered and attempted to justify why younger individuals are becoming less dependent on their cars. They suggested that a growth in social media (i.e. Facebook, Skype and gaming apps, for example, Pokémon Go) or affordability of car insurance has led younger individuals to become less dependent on their cars, and in turn seek alternative approaches to travel. This adds further justification to why age influences car use and the continued importance to research of this urban demographic characteristic.

On the other hand, the findings from the questionnaire differed from Polk (2004) and other research studies, who argue gender and deprivation were also major factors towards influencing individuals' car use (e.g. Barker, 2008; Law, 1999). Therefore, it is worthwhile to consider that the design of the questionnaire survey might have influenced the research findings. For example, it might be reasonable to argue that car ownership is typically higher amongst individuals who are heavily dependent upon the car (i.e. the sampled population). Furthermore, in specific relationship to this research study, it was typical that deprived areas were located towards the city centre of Birmingham and had a greater accessibility to amenities, such as shops and areas of employment. Therefore, it is logical to assume they were potentially less car dependent as they were within a walkable or cycleable distance to amenities. However, this research found no relationship between distance from the city centre and car use from the sampled participants. It is accepted that not all deprived areas are located towards city centre locations and can also be located in rural and remote areas, as previously outlined in earlier discussion in this work, refer to Chapter 2, Section 2.6.

It was the intention of this research study to identify FTS that might result in a reduction in car use and promote low carbon travel amongst individuals who were heavily

car dependent, achieving **OBJECTIVES 1, 3, 4 & 5**. It was therefore the intention that the findings from the questionnaire survey might be beneficial to transport stakeholders (i.e. transport planners, policymaker and campaigners) as they have begun to outline FTS that might have the greatest effect on reducing individual's car use. The questionnaire demonstrated that transport strategies are influenced by demographic characteristics. However, the findings illustrated that age was the most influential characteristic. Finally, this work further supports research by Greed (2011) who advocated the importance of planning from the bottom up, rather than the top down. As this work has suggested avoiding a one-size fits all approach (i.e. from a national perspective) when planning for new strategies and, in turn, focusing on local transport needs and requirements in order to increase uptake of alternative forms of transport. However, what was found to reduce car use in a specific area of Birmingham might not have the same influence on reducing car use in other similar urban environments. This reinforces the approach towards implementing strategies from the bottom up rather than the top down, as they could be tailored towards a specific urban demographic population.

6.3.2 Travel Diaries

The travel diaries aimed to gain an insight into individual's car use patterns over a period of one consecutive week in March 2015. By its very nature, this presents a limitation of this research as the travel diaries were not conducted throughout the same week and potentially participants were exposed to different travel conditions, for example, levels of congestion. However, this was not considered a critical limitation of this study as the travel diaries asked participants to document their travel over a typical working week. This gave participants the opportunity to take part at their convenience, as some participants were initially concerned they could not take part as they were unavailable. Furthermore, all travel diaries were conducted throughout the same month and therefore it was considered all participants were exposed to similar external travel conditions, for example, weather.

All participants were selected as they were considered to be the most car dependent (i.e. using their car every day or every other day), in order to meet the research aim and objectives, as stated in Chapter 1, Section 1.2. All participants were gained from their previous involvement with the questionnaire survey.

Initially, the findings indicated that on average individuals travelled approximately 10 miles per day. This contrasted with previous research by Giuliano and Narayan (2003) who compared urban car trips between the UK and USA. They found that the average car trip distance in the UK was 4.8 miles per day. However, it is once again worthwhile to note that this study specifically focused upon individuals who had a strong affiliation to the car, where previous research had typically ignored these groups of individuals, which presents a novelty to this research study.

This work focused towards an urban travel corridor (A38) at a local community level and therefore, all respondents were within close proximity to a major travel route by the car. This potentially made them more car dependent than if this work had been conducted in an area that actively discourages car use, such as within a congestion charging zone (e.g. London) or Amsterdam, which prompts alternative forms of transport such as cycling, walking and public transport use. Therefore it would be reasonable to expect that the sampled population would have a higher than average car trip distance per day, as this research did not take a cross-section of car trips from different users as it focused on people who used their car every day not once or twice a week or fortnightly.

The main justifications for car journeys were for employment, leisure or family commitments. The justifications participants provided were expected, as previous studies have identified similar findings (e.g. Pearce and Lee, 2005; Schlich et al., 2004).. Additionally, the travel diary findings also correlated well with the questionnaire survey, as the findings seemingly appeared to indicate individuals preferred the car compared to alternative forms of transport. For example, 80% of car trips taken by the participants were feasible and within a close proximity to either a train or bus services. This in turn, allowed the findings to be validated against previous research, as logical responses were provided by the sampled population and based upon the research from this work.

This work has begun to reinforce the urgency for new transport strategies to be developed, with the intent of reducing individual's car use, as it has shown there is a willingness amongst individuals to reduce their car use but they are still heavily reliant on their cars for their daily travel. In addition, the findings revealed that most alternative forms of transport were within a feasible distance, as defined by the definition outlined in Chapter

5, Section 2.2. However, the sampled population considered alternative forms of transport too far or difficult to access. This could present a limitation of this empirical research. For example, if this work was conducted again with a different sampled population, they could suggest that alternative forms of transport were within a feasible distance as they might be prepared to walk or cycle in order to access alternative forms of transport. However this work has uncovered some interesting findings. From a review of the current transport literature, no research study has been discovered that has sought to understand how willing the most car dependent members of society are prepared to reduce their car use in favour of alternative forms of transport, when based on the empirical methods used throughout this work.

Furthermore, the preference towards the car identified by the sampled population was despite local and national transport incentives, such as Birmingham's Cycle Revolution or *Cycle2Work* schemes, which aim to encourage individuals to use alternative forms of transport to the car. However, transport policies often target those individuals who have shown or have identified a willingness to want to change their travel patterns or individuals who currently commute by cycling work (e.g. Ogilvie & Goodman, 2012 and Burgess et al 2000). In contrast, this work has identified that a greater emphasis should be placed on the most car dependent of individuals, if local and national targets are to be achieved, which aligns well with research by Mattioli et al., (2016). This work encouragingly provides data to suggest there to be a willingness amongst the most car dependent individuals to change their travel attitudes and behaviour if the right policies are introduced by transport stakeholders (e.g. planners and policymakers).

In light of the above, it is therefore reasonable to argue that current transport strategies would appear to be failing and new strategies are required. The findings from the work seem to suggest strategies are not promoting a reduction in car use, meeting the needs of individuals, or encouraging an inadequate uptake of alternative forms of transport.

All the participants were required to document the time of their car trips (i.e. their start and end of their trips). Travel patterns indicated there to be an association with time and age. For example, Under 25s and Over 65s were most likely to travel at off-peak hours. The participants were specifically asked to discuss the purpose of their trips and were not

asked to record why they had decided to travel at a particular time – this was not an objective or an intention of this research study. It is possible that flexibility and access to discounted travel might be reasonable justifications to why different ages travelled at different times and this presents a potential limitation of this work as it did not investigate why participants decided to travel at a particular time. Typically, it is reasonable to suggest Under 25s and Over 65s have a greater level of flexibility throughout their daily routines and have greater accessibility to discounted travel. In general, discounted travel is only available at off peak hours. A plausible justification might be that peak hours are when the greatest number of passengers travel and transport services are provided by private travel companies (in the UK) who want to maximise their profits. Therefore, in order to maximise their profits, transport services charge higher prices at peak hours and it is unlikely private companies will want to reduce their charges when they make the greatest profit. Furthermore, external constraints, for example, hours of employment might regulate and restrict individuals' travel times. In addition, individuals may be less willing to travel at off peak hours as this research has shown that it is typically quicker to travel by car – further justifications are discussed and outlined in Chapter 5, Section 5.2. However this once again continues to illustrate the potential significance age has on car use – concurring well with the questionnaire findings, which found that age was the only demographic characteristic to identify a significant relationship with car use and FTS ($p = 0.018$). In addition, the findings gained a useful insight into the potential travel patterns of individuals who were recognised to have strong car use and it is unknown of any other study has specifically investigated individuals who are car dependent along a specific travel corridor, and to the level of detail as described in this work.

In general, previous research has often overlooked or failed to investigate the travel needs and attitudes of these groups of people. For example, research studies have typically explored groups of individuals (e.g. Anable, 2005; Steg, 2005 & Steg and Vlek, 2005), households (Gärling et al. 2000; Gärling and Schuitema, 2007 & Martin et al. 2010) or individuals (Gardener & Abraham, 2007; Cullinane, 2002 & Lorenzoni et al. 2002) who have a willingness and appetite to want to reduce their car use. It is acknowledged similar studies used travel corridors to explore travel behaviour and attitudes such as Van Exel and Rietveld (2009) in terms of car and train commuters. Van Exel and Rietveld (2009) work was based on

secondary analysis on travel survey data compared to this study that focused only car drivers and used a mixed methods approach. Furthermore, all of the participants for this work were considered to be unwilling to reduce their car use. This contrasts to previous studies that typically research participants who have a willingness to reduce their car use, as detailed in the above literature and throughout the literature review in Chapter 2.

Finally, the data indicated that most individuals had a poor awareness of their actual car trip costs. The data collected had similarities to Ivehammar and Holmgren's (2015) study who reported similar findings thus further confirmation of previous work. The findings began to suggest how participants might perceive cost and the potential disconnect between frequent costs (i.e. those incurred every day) compared to infrequent costs (i.e. weekly, fortnightly, monthly or annually and thus more easily forgotten). Chapter 5, Section 5.2 outlined further potential justifications to why participants might have underestimated their car costs. On the other hand, it might be plausible to suggest advances in technology, coupled with an increase in user interaction and understanding, might influence travel behaviour and attitudes. Toledo et al. (2008) describe how In-Vehicle Data Recorders (IVDR) are being used to provide real time information to drivers regarding their driving behaviour, which is benefiting insurance companies, licensing authorities, parents of young drivers and road authorities. Other technological applications such as Map my ride (https://www.mapmyride.com/) or TrackMyTour (https://trackmytour.com/) might too influence travel attitudes. This in turn could influence travel perceptions and attitudes. However, this might present a potential limitation of this research study as the data was collected over a relatively short timeframe due to practical constraints (e.g. time and financial costs).

It is worthwhile to note it might be reasonable to argue there will continue to remain a degree of uncertainty regarding transport futures as the growth in technology continues and changes, in an attempt to respond to socio-economic conditions. This therefore validates the need for continuous research within the research community, in order to understand how technology can and might affect travel habits and attitudes in the future. Chapter 2, Section 2.2 also outlined that most new transport technologies were typically unaffordable to the majority of individuals, and as such they were not available on the mass market. It was therefore considered to be more worthwhile to focus upon transport modes

that are broadly and typically used throughout most modern societies (i.e. petrol power cars) in order to understand how FTS may influence travel attitudes and behaviours in the near future (i.e. within the next 30 years).

6.3.3 Interviews

In total, twenty-three interviews were conducted in order to determine the potential problems, practicalities and barriers that might arise when developing the proposed FTS and incentives that were derived from the research studies (refer further to Chapters 4 & 5). All interviews lasted for approximately one hour and were based on a face-to-face semi-structured approach. It was acknowledged the interview sample was a relatively small sample size (twenty-three interviewees). However, the interview sample was considered sufficient as the overall research study was based upon a mixed methods approach. This therefore allowed the research findings to gain a broad range of travel opinions throughout this work. A semi-structured approach was used to gain a detailed insight into travel strategies and measures. It was perceived this would allow for a significant discussion to take place in comparison to the questionnaire survey that typically gained prescriptive and generic responses as no direct face-to-face questioning with participants occurred. Chapter 3, Section 3.8 outlines in further detail the potential limitations, benefits, and constraints of conducting an in-depth semi structured approach and the justifications for conducting a mixed methods approach.

The initial eighteen interviewees were asked to discuss how a series of theoretical FTS, measures and incentives might influence their car use attitudes. In the main, interview discussions focused upon individuals travel attitudes that they documented throughout their travel diaries. It was the intention to investigate which travel strategies could be implemented to reduce their car use, hence discussions were focused on them. However, it was also discussed with respondents how the theoretical FTS, measures and incentives might influence the travel attitudes of individuals. In turn, this allowed for a broad range of travel attitudes and perspectives to be gained. All participants were informed that the questions throughout the interviews were derived from previous research associated to this study. Furthermore, in order to enhance participants understanding of the research study they were shown two imaginary street scenes to gain an insight into how future transport

networks could potentially look and be designed (refer to Chapter 3 for further justification and **Appendix 7**).

Initially, the participants discussed the current cost of public transport in comparison to their actual car cost. Participants' car costs were sourced from their travel diaries (refer further to Chapter 5, Section 5.2). This illustrates the importance of each research stage as it informed the next. The data once again appeared to indicate that there was an association between age and travel costs but also deprivation (refer to Figure 5.6, Chapter 5). It was anticipated that there would be an association between public transport costs and deprivation as individuals from deprived areas might have less disposable income. Therefore any cost saving might be more advantageous to individuals from deprived communities, as it might be reasonable to assume people who live in wealthier areas might have a greater level of disposable income. In addition, participants sampled from less deprived areas, for the purpose of this study, potentially had a greater opportunity to afford to travel by a variety of transport methods, and in turn they may be less affected by the cost of public transport. The findings seemed to demonstrate that different transport strategies might influence travel attitudes differently compared to demographic characteristics. This contrasted with the findings of the questionnaire survey and travel diary, which primarily indicated age to be the only demographic characteristic to have a significant effect on car use. The findings reconfirm the influence urban demographic characteristics have on car use. This reemphasises the significance of conducting a mixed methods approach as contrasting data was gained throughout this work.

Surprisingly, the findings indicated participants over 65 thought public transport was too expensive (for example, Participant 2) – this was not anticipated as it is typical for individuals over 65 to be entitled to a free bus pass or senior rail card, and therefore they are able to access free or discounted travel. All six participants who were interviewed over the age of 65 had either a bus pass or senior rail card, which allowed them the opportunity to access discounted travel. However it is worthwhile to note that discounted travel is typically only available at off-peak hours. This work further confirms how transport strategies are failing to meet individual's expectations. Potential justifications for this perceived anomaly included:

1) Participants might have been reflecting upon the cost of transport for other individuals in society, and not their personal travel cost.

2) Lack of understanding or misconception regarding how to access discounted travel as all participants were dependent upon their cars.

3) A perception that the cost of public transport was still too expensive, particularly at peak hours when discounted travel tickets are typically invalid.

4) Participants had not used public transport in a long period of time and thus might have been basing their opinion towards travel preferences on peers or media reports, which might provide biased opinions.

All participants were reminded to respond using their own travel experiences and not what they thought to be potential general opinions. However, the cost of public transport being too expensive was clearly described by Participant 2. As described in Chapter 5, Section 5.3, peak charging and issues associated with peak charges have been extensively researched. However, this research has unearthed some interesting findings regarding individuals who are highly car dependent; an area of transport research which is often ignored. The findings seem to suggest that the sampled population actually did not mind how they travelled and they were only travelling by their car because it was considered and perceived to be the cheapest opinion, which presents an encouraging finding for transport planners and policymakers. This begins to question: are people really car dependent, or do they consider the car is the only option for their daily travel? Previous research has often suggested car dependent individuals prefer traveling by their car and fail to explore alternatives forms of travel only traveling by alternative forms of transport as a last resort (e.g. Alsnih & Hensher, 2003 and Dallen, 2007). However, this work presents an alternative and contrasting approach, as the sampled participants for this study had clearly considered the cost of travelling by alternative forms of transport, but typically considered the car to be the cheapest method of travel.

However, it is worthwhile to highlight the potential implications of selecting respondents deliberately because they had a strong car dependency. For example, the

participants might have a poor recognition of the actual cost of public transport. Research studies have indicated car drivers typically overestimate the cost of public transport and traveling time (e.g. Fujii et al., 2001; Gardner and Abraham, 2007; Hine and Scott, 2000). Research studies (e.g. Brown et al., 2003; Fujii and Gärling, 2005; Thøgersen, 2006) have suggested if car drivers have a greater experience of, or if they were exposed more too public transport, it has the opportunity to reduce their negative perceptions or preconceived narratives. However, in order to address the research objectives, it was the intention of the research study to gain the views of individuals who were car dependent, not individuals who used had a willingness to use alternative forms of transport. Further research might therefore benefit from asking participants who predominantly have a strong car use to take trips by alternative forms of transport and discuss their experiences. A further eight potential measures or incentives were identified to encourage greater usage of alternative forms of transport. They were: Segregated Cycle Lanes, Individually Designed Public Transport Services, Overcrowding, Increased Segregation, Increased Frequency and Reliability, Security Improvements, Education of Transport users and Highway design and investment.

This research study found that not all of the above measure or incentives were relevant to each interviewee. For example, Participant 14, received a mobility allowance, therefore improvements to cycle lanes would have little benefit or disbenefit and implementing a congestion charge seemed less likely to affect individuals from wealthier backgrounds. Once again, this contrasted with the questionnaire survey as the findings suggested other demographic characteristic, for example deprivation, effect travel attitudes too and therefore should be taken into account when developing FTS. This also highlights that not all transport strategies will influence every individual's car use the same, even if the findings indicate they have the greatest overall effect to reduce car use, they will not change everyone's car use.

Throughout the initial eighteen interviews, it was acknowledged there to be potential practicalities or constraints that might exist towards implementing the hypothetical measure or incentives that had been proposed by participants. An additional five interviews were therefore conducted with transport experts to investigate the potential obstacles that might arise if the hypothetical transport strategies were developed and

implemented. All transport experts were informed that the strategies and measures discussed throughout the interview were developed based upon the findings gained from previous research for the purpose of this study (e.g. questionnaires, travel diaries and the initial interviews).

All transport experts appeared to unanimously support the suggestion that more should and needs to be done in order to promote the reduction in car use to favour a greater usage of alternative forms of transport. However, it quickly became apparent, that transport experts had different opinions regarding how to potentially achieve a reduction in car use through transport strategies. For example, one interviewee argued public transport costs were fair and that the public, in general, had a misconceived perception regarding the costs. On the other hand, another expert suggested current fares were too expensive. Even though all five experts were from the transport industry, they represented different aspects of the industry, for example, consultancy to charity stakeholders, with the purpose of gaining a fuller picture concerning the theoretical FTS from a local perspective. The responses gained indicated conflict, contradiction and professional interest amongst all transport experts, and in turn demonstrated the complexity of implementing transport strategies in order to promote alternative modes of travel. Hence, there might be justification in suggesting one organisation, for example, Department for Transport, has central control and accountability for developing and implementing national transport strategy in the UK. In contrast to taking a holistic approach, this could allow a multi-stakeholder approach to inform transport policies at a local rather than national level. On the other hand, involving multiple stakeholders (e.g. transport planners, academics and members of public) might potentially increase the likelihood to design and develop transport strategies, which are more accepted by different members of the community throughout society – an objective of this research, for example, **OBJECTIVE 3**. This was one of the key findings of this research that transport strategies should be tailored towards different individual's needs and it therefore might be beneficial if FTS were developed at the local level by key transport groups. On the other hand, by assigning a national organisation, such as the Department for Transport to implement transport strategies, this could ensure the accountability of each transport strategy. In total, eight potential practicalities and constraints that might arise if the hypothetical measure or incentives were implemented:

Financial Implications, Public Perception, Simplified Ticketing Systems, Political Willingness, Educating Transport Users, Privatisation of the Transport Network, Tailored Transport Services and Reliability and Later Services. The practicalities and constraints evolved by reviewing each interview to determine specific themes and reviewing this with transport literature, which discuss the limitations of some transport strategies, as outlined further in Chapter 2.

Finally, despite all of the five transport experts appearing to encourage a reduction in car use in favour of alternative forms of transport, they had different visions about how to achieve this. All experts suggested the importance of national political willingness in order to implement successful and progressive transport strategies to reduce car use in favour of alternative forms of transport. This reinforces the complexity and integration that must evolve in order to promote effective transport strategies to become recognised and engrained into the public realm, but this research appears to have unearthed a continued frustration amongst the transport experts of the local community. The sampled experts suggested that they wanted to promote a greater usage of alternative forms of transport, but often they were constrained by transport policy and private ownership of public transport services. This research contrasts to current UK policy, which currently emphasises private over public finance (e.g. Bromley and Meyer, 2014; Ball et al. 2014 & Bodie, 2013). The findings from this work seem to suggest that support for alternative forms of transport must be nationally driven. However, each regional transport network must be tailored to meet the needs of the local population, thus transport strategies should be conceived to meet the local travel needs and demands of the community.

6.4 Recommendations for Transport Practice

6.4.1 Introduction for Future Transport Practice

The unprecedented nature of this study has uncovered a number of key suggestions for transport stakeholders along a specific transport corridor. It is typically acknowledged that the car is the preferred method of transportation for many, despite on the whole there being broad opportunities to access alternative forms of transport. In the main, the sampled population perceived public transport as a poor option in comparison to the car. Despite this, this work has shown there to be willingness amongst individuals, who are predominantly car dependent, to reduce their car use, if the right travel strategies were

enforced. In addition, this research demonstrated that demographic characteristics influence car use and transport strategies should be developed accordingly to reflect them. Therefore, it is critical that transport strategies are targeted towards specific demographic groups. Transport stakeholders, such as local authorities or transport planners, can therefore use readily available data, for example, census data to identify and target different transport strategies that will be more applicable to different characteristics groups throughout society. The risk of taking this approach, however, is some urban demographic characteristics might not have been identified, researched or excluded from this study and are yet to be investigated. In the present day, there are limited guidelines to inform transport stakeholders about how to effectively develop transport strategies based upon demographic characteristics that target specific groups of individuals (e.g. those who are strongly car dependent). Yet still, there are national and local transport targets and monitoring of car use, for example, car ownership per household. Furthermore, often, transport strategies that aim to curb car use are poorly implemented, developed or misinterpreted. The discussion below outlines how transport planners, transport authorities, transport operators and other transport professionals and stakeholders can develop transport strategies to have the greatest effect on reducing individual car use. This confirms the influence and importance that this study could have on informing local, national and global transport agendas to reduce car use and promoting low carbon societies, achieving **OBJECTIVES 2, 3 & 4**. Hickman et al. (2010) emphasise the transport challenge, arguing underestimating the task to change individual's car attitudes would be at the peril of society. As noted above, this work provides transport suggestions for a specific travel corridor. Based on this, the findings might have limited benefit outside of this corridor, however, could be used as a starting point to reduce car use along a similar travel corridor.

6.4.2 Suggestions for Transport Stakeholders

The next section of this chapter makes suggestions that may benefit transport stakeholders in order to encourage individuals who have a strong affiliation to become less reliant on their cars, in turn reducing their car use in favour of alternative forms of transport. These measures are the direct result of this research study. It is anticipated they will be part of a wider package of measures that could be implemented through local and

national policies to reduce car use, and that some measures will be easier and quicker to implement than others. The suggestions are categorised into hard and soft transport strategies.

6.4.3 Suggestions for Hard Transport Measures

The lack of segregated cycle lanes were highlighted throughout the interview discussions (refer to Chapter 5) to be a major deterrent for individuals unwilling to cycle, hence reinforcing their strong preferences towards the car. For example, 87% of participants (n=16) suggested there to be inadequate links between alternative forms of transport, and 17 participants suggested current cycle lanes are currently unsafe. This research found that for cycle lanes to be most effective they would need to be completely separated from cars. This contrasts with some other studies, which promote mixed spaces through urban and suburban environments (e.g. Thompson, 2002; Yiftachel & Yacobi, 2003; Sandström et al. 2006 & Tilley et al. 2017).

A potential benefit might be that users would benefit from using such cycle lanes, as they would be totally separated from cars and other road users, such as pedestrians. In addition, this research found that for cycle lanes to be of benefit they needed to go where cyclists want or need to go, for example, from residential to employment locations. Throughout this research, participants often suggested current cycle lanes are too infrequent and often just stop at random locations. Based upon data from this study, most car journeys in the UK are approximately no longer than 1.5 miles. It therefore would be logical to promote a minimum length of all cycle lanes to reflect the average trip journey in the UK. There is currently no legislation in the UK that enforces the length of a cycle lane; there are only guidelines to the width a cycle lane.

These cycle lanes could act similar to *"car highways"* and therefore primarily be built for cyclists but could also be accessible to other modes of alternative transport (e.g. walkers or motorised wheelchairs). However, a solid line or a guardrail would separate cyclists from other alternative transport users, for example, walkers. It is typical that a solid white line separates shared footpaths in the UK. These cycle highways could be either implemented alongside a road, or by removing road space in favour of them. It is accepted if road space was reduced this might increase road congestion as roads would be smaller and this could

frustrate car drivers, who might then seek alternative forms of transport. However, as outlined above, the sampled population for this study were not in favour of mixed space use and this directly contrasts with planning strategies and research that promotes the development of mixed spaces (e.g. Cheung and Tang, 2016).

On the other hand, if more people were cycling instead of driving, less road width would be required as fewer cars would be using the road. It has been acknowledged through recent research that detours can be developed to encourage a greater usage of alternative transport. For example, Ogilvie et al. (2016) studied travel attitudes of adults in Cambridge, finding that convenience, pleasantness, speed, reliability and safety and traffic-free paths were all major factors influencing individuals' travel attitudes. In addition, the study found that those individuals who engaged in alternative forms of transport had a lower sickness-related absence at work and improved well-being. This therefore illustrates further the economic and social benefits of promoting and encouraging alternative forms of transport from a business as well as a personal perspective for the whole community.

A major barrier for implementing cycle lanes was acknowledged to be the financial burden, as outlined and discussed amongst transport experts in Chapter 5, Section 5.4. For example, it is unlikely such a strategy will receive government funding, particularly in a time of austerity and governmental cuts. It would be reasonable to develop cycle facilities alongside all of the main roads in urban areas similar to that of the Netherlands or Munster. Alternatively, selected roads could be designated as cycle roads, enabling cyclist to have priority over car users. A similar strategy has been implemented in Jersey, in the Channel Islands, where they have designated green roads. In order to develop, implement and maintain such cycle lanes, car drivers who persist to drive in urban areas could be charged a standard charge. This could be similar to the congestion charge as imposed in London or Singapore. On the other hand, Wardman et al. (2007) offers an alternative approach to encouraging a greater level usage of alternative transport, focusing upon cycling. They found in order to achieve ambitions and government transport targets, it would be worthwhile to offer financial incentives to increase cycle rates, for example, £2 per day. It was shown this could increase cycle rates by three-fold. The importance of funding cycling is broadly accepted particularly at a local level through incentives. For example, Goodman et al. (2013) studied eighteen different locations in the UK. They all increased their expenditure

on cycling from typically £1 to £14 – 17 per person, and in turn levels of cycling increased. However, in a time of austerity it is unlikely the UK government will adopt a policies which actively pays people to cycle to work.

Throughout this research study, public transport costs were considered in general to be too expensive and hence the cost of public transport was determined to be a major restraint and factor why individuals have a preference towards the car. For example, the FTS to have the greatest effect to reduce car use was a 25% reduction in public transport fares (refer to Chapter 4, Section 4.5) and this was reinforced by 32% of all questionnaire participants, who stated public transport fares were too expensive. A preference to reduce transport fares was further confirmed throughout detailed discussions with transport stakeholders (refer to Chapter 5, Section 5.3). For example, five out of the six participants aged 25-65 indicated public transport was too expensive. In addition, transport experts acknowledged the complexity of public transport fares and some experts agreed that transport fares were too high.

Road pricing has continued to be well-established since it was developed by the Smeed Report (1964) and it was explored as one of the FTS within the questionnaire. Subsequent reports have endeavoured to support the benefits of road pricing, for example, the Eddington study (2006) or the Strategic Roads Policy Review in 2013. Despite the transport benefits of such strategies being widely applauded, they still appear to be underutilised (May and Milne, 2000; McArthur et al., 2012; Burchell et al., 2015; Bayliss, 2008). It is often suggested a degree of misunderstanding is often associated with the introduction of new strategies. For example, Walker (2011) surveyed users of toll roads across European countries (e.g. France, Portugal, Spain and UK), finding that initially people were opposed to such toll pricing and they did not understand the benefits. However, all this changed after continued interaction the public opinion changed and favoured the implementation of toll roads. This therefore reinforces the importance of developing transport strategies that have individual's acceptance. Reducing public transport fares is not new a new phenomenon and it has long been considered as an effective strategy to increase passenger numbers. For example, the South Yorkshire Passenger Transport Executive introduced a low-fare policy in 1974, discussed and outlined further by Hay (1986). This policy was considered extremely popular and increased passenger numbers of public

transport; however, for political reasons it was discontinued. This suggests the complexity between introducing transport strategies, but at the same time there needs to be political willingness, concurring with discussions held with transport experts, refer to Chapter 5, Section 5.5.

Further discussions in Chapter 5, Section 5.4 recognises that it was unreasonable to suggest transport operators, who are privatised in the UK, would have willingness or the motivation to want to reduce their fares, as their aim is to maximise profits. Therefore, it might be unpractical and unrealistic to suggest a reduction public transport fares. On the other hand, it was acknowledged throughout this research study that a new and simplified fare system needs to be developed. It is acknowledged that a smart card is currently being introduced onto public transport services in Birmingham. This card is called Swift and will be similar to the Oyster card in London. However, this card can only initially be used on buses and trains and could be obsolete by the time it is fully implemented as the Oyster card is already been phased out in favour of contactless payment or apple pay.

Chapter 5, Section 5.5 explored a series of strategies that ranged from introducing standardised fares to scrapping peak and off-peak charges. Peak charging were continuously considered unfair and unjustified by the sampled population of the interviews (n=15). For example, standardised transport fares, regardless of time, could be implemented across specific distances (i.e. 5K, 10K or 15K). In addition, as an incentive for passengers to use public transport a loyalty scheme could also be introduced. This policy might be implemented similar to an air miles system, rewarding passengers depending on the number of trips they take. For example, passengers could receive a free trip for every tenth trip taken by public transport; however, passengers could only incur one trip per day. This could be similar to the Travel Smart Reward scheme, as offered to commuters in Singapore. Commuters earn points for every trip they take by public transport and can earn extra points for taking journeys in decongested hours (e.g. 06:15 – 07:15). This would in turn elevate earlier discussions in Chapter 5, Section 5.3 relating to equity for those individuals who lived outside of a zone.

However, it is unlikely that this policy could be implemented on a national scale as the UK transport network has been privatised. They are currently operated and supplied by

a multitude of travel providers, and obtaining agreement initially amongst different stakeholders could be troublesome. Hence, it might be more reasonable to introduce a transport loyalty scheme within the area of Birmingham, similar to the ticketing systems described in this chapter in London or Singapore. If successful, the area of the loyalty scheme could be increased. It would therefore be a logical and reasonable approach if transport stakeholders wanted to adopt similar transport strategies (i.e. local loyalty schemes); they should do so by learning lessons from a worldwide perspective.

6.4.4 Suggestions for Soft Transport Measures

The data suggested a preference towards more policing on public transport services in particular at night. The findings revealed that a current barrier for the elderly and young for not wanting to use public transport was the perceived lack of visual policing at night. In total, more than half of the participants aged below 25 and above 65 stated a preference for wanting more policing at night. The sampled population identified safety to be a key future travel incentive to reduce car use (refer to Chapter 4, Figure 4.6). However, if more policing were to be introduced on public transport services, or conductors were present as discussed in Chapter 5, transport fares might increase in order to account for additional costs in staffing. It is reasonable to assume transport providers would have little appetite to pay for additional staff. This research found an increase in public transport fares would typically discourage most individuals (refer to findings in Chapters 4 & 5). However special constables could be provided by the British Transport Police (BTP). Special constables are volunteers, hence no additional costs would be incurred; therefore it is logical to assume there would be no impact to fares. The BTP and transport operators could use local knowledge, data from operators, or take a common sense approach to inform them of where it is most likely younger and older individuals are to use public transport services and specifically target those areas. This research found individuals from these two demographic groups were more fearful of using public transport at night. Previous research by Stradling et al. (2007) and Hine & Mitchell (2001) and others have suggested that the elderly are more fearful of travelling at night on public transport, but not the young. This research therefore concurs well with previous studies relating to older individuals, but at the same time contrasts with other research studies, which suggests that younger people are more willing and less fearful to travel on public transport at night.

The findings demonstrated that the second most popular travel incentive was to improve feasibility and the number of public transport services (refer to Chapter 4, Figure 4.6). Further in-depth discussion (refer to Chapter 5, Section 5.3) with participants revealed overcrowding to be a primary reason why they felt there should be more public transport services provided, particularly at peak hours. However, as outlined in Chapter 5, it might not be financially viable to operate additional public transport services. For example, it was recognised that the current UK rail service are operating at nearly full capacity, as shown by Frost et al. (2012), and platform lengths might not be long enough for extra train carriages, or extra carriages might not be available. Therefore, even if there was a desire to provide additional services it may not be possible to provide these based on the current infrastructure. All transport experts acknowledged public transport operators prefer refurbishing existing rolling stock compared to buying new units (i.e. new train carriages). Therefore, in order for new transport strategies to be feasible and realistic they must consider the financial implications. A strategy discussed in Chapter 5, Section 5.2 outlined implementing standing only carriages. It would be the intention that this would allow more passengers to travel, in turn alleviating overcrowding, as this was also found to be a major barrier for not wanting to travel by public transport. This research study accepts that standing only carriages may not be the most comfortable way to travel. However, passengers would have the choice if they wanted to travel in a standing only carriage or not (i.e. a carriage with seats). This would mean that no one would feel excluded or unable to travel (i.e. the elderly who may require a seat). As discussed in Chapter 5, some passengers might expect a seat for longer journeys (i.e. over 30 minutes) and therefore this strategy might only be applicable to cross-city services, rather than intercity services. If passengers chose to travel in standing only carriages they would pay a reduced fare, similar to the current first and standard class offered on most public transport services. The ticketing system would work similar to travel by low cost airlines, for example, Ryanair or EasyJet where it is possible to tailor a journey and pay accordingly to what the passenger wants. This would be enforced by on-board conductors.

In total, the participants made nine car trips per day. This work has shown that for most people it was feasible to use public transport services. This was despite the findings indicating that journeys were quicker at peak times by alternative forms of transport.

However, only 19% of journeys were quicker during off-peak hours using alternative forms of transport (refer to Chapter 5 Figure 5.3). The data collected as a result of the questionnaire survey indicated, in the main, flexibility and convenience was the highest stated factor to influence an individual's car use (refer to Chapter 4 Table 4.5). Therefore, despite alternative transport modes being feasible to use, in the main, they were found to be a poor alternative to the car, particularly at off peak hours. It is reasonable to suggest that individuals make multiple trips throughout the day, and therefore travel at both peak and off peak times. However, peak charges typically apply for a shorter period than off-peak charges. It is therefore logical that throughout off-peak hours the car was shown to be quicker than alternative forms of transport. This appears to further provide a limited incentive for an individual to want to use alternative forms of transport, especially if they have a strong affinity to the car, in particular at off-peak times

Furthermore, the interview discussions found there was a feeling that public transport was considered too unreliable, infrequent and inconvenient. To improve reliability a strategy emerged from some interview participants that advocated shortening the trip lengths of public transport (e.g. bus routes), for example, Participant 10. Based upon the travel diary findings regarding average trip lengths, it would be reasonable to suggest that no bus route should exceed a ten miles radius. Therefore, if bus routes were shorter, this could improve aspects of frequency or reliability, as an individual service would hypothetically encounter fewer traffic incidents and delays. Shortening bus routes has previously been acknowledged and proposed by transport organisations and operates as an effective strategy to improve bus reliability. For example, Transport for London (TfL) disaggregated bus route 159 as the result of heavy road congestion and roadworks (TfL, 2014). Furthermore, the benefits and limitations of shortening bus routes have been further discussed by Carley et al. (2013). It is not envisaged that reducing the distance of bus routes would require additional buses. Therefore, there would be no additional cost implication towards travel operators. It is worthwhile to consider that trip distances may be shorter for individuals who live in urban areas where amenities are more concentrated (i.e. shops and schools). Therefore, it is likely that this transport strategy will have greater gravitas towards urban areas because individuals are more likely to make shorter trips. It is accepted that this proposal will have a disbenefit to individuals who want to travel longer distances (i.e. longer

than 10 miles) but will benefit most individuals (based upon the research findings) who want to make shorter journeys.

Finally, the importance of road awareness was highlighted throughout this study. In particular, the travel diaries indicated that the cost of driving was often miscalculated and hence the costs of alternative forms of transport were typically misjudged; refer to Chapter 5, Section 5.2. This concurred well to other research studies which have long advocated that people underestimate their car expenditure (e.g. Cade et al. 1999; Goldberg, 1996; Bortolotti and Antrobus, 2015 & Schouten et al. 2015). It is therefore logical to understand why alternative forms of transport have become less desirable, especially to individuals who have a strong affiliation to the car, due to misconceptions regarding alternative forms of transport.

As a consequence of this research, transport authorities, transport campaigners and policymakers are encouraged to promote the financial aspects of using alternative forms of transport over the car through advertising on TV, or organising promotional alternative transport days at schools and colleges. As this research study has shown that different transport strategies are required for different urban characteristics, it would be advantageous to exploit different advertising platforms such as social media, TV or billboards to target different groups within society. Some forms of social media such as Facebook could be free to use and therefore, they may be a more attractive tool for private organisations to exploit target markets. It is critical to target different and specific media platforms as it is widely recognised that young people are more likely to use the internet than older people (Bakker and de Vreese, 2011). For example, promotional days could be organised by transport volunteers (similar to regional champions), teachers or students. For example, students could organise alternative transport workshops in conjunction with extracurricular activities e.g. Duke of Edinburgh Award (DofE). The DofE award inspires young people to develop their personal and employability skills and engage with the wider society. Therefore, this would be at no additional cost to transport operators, but they would potentially benefit from increased passenger numbers and also have the added advantage of inspiring the next generation to consider the environmental impacts of transportation.

6.4 Chapter Conclusions

The main intention of this chapter was to outline some of the key findings of this work for the individual methodology and to begin to discuss, investigate and explore how some of the findings from this empirical research study might be implemented into a specific travel corridor in Birmingham, UK. This work initially recognised that some transport strategies and policies are not meeting individual's travel needs and aspirations 9refer to Chapter 2, Section 2.5). The empirical methods of this work confirmed this in specific reference to individuals who were considered to be highly car dependent (refer to chapters 4 and 5, respectively).

The initial section of this chapter outlined some of the potential limitations and benefits of the methods that were used throughout this work; this was a key finding of this chapter. In particular, Section 6.2 recognises alternative methods or approaches could have been used for the purpose of this research in order to respond to the aim of this research study, as detailed in Chapter 1, Section 1.3. However, the methods and the approaches chosen for this work were considered the most logical methods at the time of the study, in order to respond to the key research aim and objectives; further justifications for each method are outlined throughout Chapter 3. However, if this research study or a similar study was conducted again, it might be beneficial to adopt a different approach in order to address different cultural or social backgrounds that might exist in different urban environments.

The key findings from each of the methods were then discussed. The order in which the methods were conducted was the order in which they were discussed throughout this chapter. The questionnaire results revealed that age was the most influential demographic characteristic, but at the same time recognises further investigation and research was required in order to understand how some participants might respond to a questionnaire survey if it was conducted face-to-face, as earlier discussed in Chapter 3, Section 3.6. As this research study wanted to focus on individuals who were highly car dependent, the participants who had indicated they either drove every day or every other day in the questionnaire survey were chosen at random to take part in further research. This allowed for everyone who met the research criteria to have the same opportunity to be selected for further research. Although age was shown to influence car use, throughout most of the

initial research findings it became apparent that other demographics characteristics also influenced car use, which is a key finding of this study. It is widely recognised that demographic characteristics influence travel preferences (e.g. Hand et al. 2005; Cao et al. 2007 & Cao et al. 2009). However, how FTS which could be developed and implemented in order to influence the travel preferences of individuals who are highly car dependent is still largely unknown. This reinforces the importance of conducting the travel diaries and interviews amongst this specific group, and this work begins to address some of the gaps in transport research.

A review of current transport literature indicates there to be two key avenues for transport strategies; these were soft and hard transport strategies 9refer to Chapter 2, Section 2.3). It therefore seemed logical to identify some transport suggestions for transport stakeholders into two distinguished categories. The recommendations that were discussed in this chapter were the consequence of the key findings from this work (as referred to in Chapters 4 & 5 respectively) and have been developed and informed by existing travel strategies both from a UK and global perspective. However it is recognised that some of the recommendations for transport practice, as outlined in Section 6.4, were recognised to be easier to implement than others; all of the suggestions are specially tailored to the selected population. It is unknown of any other empirical research study that has investigated the travel habits and attitudes of individuals who have a preference to the car in order to inform FTS along a specific travel corridor. This is one of the key contributions of this work.

Throughout this work, it has been recognised that it has been based on specific travel corridor. To improve the validity of the findings it would be beneficial for future research to compare similar travel corridors. Furthermore, the use of different methods such as focus groups might be advantageous to conceptualise how some of the FTS highlighted in this work could be integrated in the current transport network. The final chapter of this work, Chapter 7, outlines the research conclusions and proposes avenues for further research.

Chapter 7

Chapter 7: Research Conclusions

7.1 Introduction

Initially, this chapter provides a summary to how this work has sought to achieve each of the five objectives, as stated in chapter 1, section 1.4. It then outlines the key research findings from this work evaluating how they can be used for future transport policy development and, how the findings might inform transport stakeholders (e.g. planners, policymakers and campaigners). The final section of this chapter provides an overview of some of the potential avenues that future research might investigate and analysis based on the findings from this work, in turn achieving **OBJECTIVE 6**.

7.1.1 Responding to Research Objectives

This research study was based on five key research objectives. The next section of this chapter will discuss each objective in turn, and briefly describe how this work sought to respond to and achieve each of them.

OBJECTIVE 1: To investigate **how travel attitudes of individuals who are highly car dependent vary according to different demographic characteristics at a community level**.

A travel questionnaire was hand delivered to 3,000 households along an urban travel corridor to people living across ten different deprivation levels. This was considered to allow for a wide range of travel attitudes and behaviours to be initially gained across a broad demographic characteristics. All of the participants of the questionnaire were required to hold a full driving licence. This therefore meant all participants were either car drivers or had experience of driving a car. Further research was then conducted with some participants (from the questionnaire) who had indicated they were the most dependent on their car for their daily travel. A greater insight into the travel behaviour attitude of individuals was then established amongst participants who were the most car dependent from the questionnaire sample. Furthermore, demographic characteristics were categorised into different groups, with the intent of achieving an even distribution amongst different demographic characteristics. Based on the findings from the questionnaires, it would be logical for transport strategies to focus on targeting different age groups in order to meet their travel needs and demands.

OBJECTIVE 2: To **engage with a range of transport stakeholders** in an attempt to understand how future transport planning strategies might enable a reduction in car use.

In total, over 3,000 transport stakeholders had the opportunity to inform this work. The questionnaire provided the opportunity to engage with the most car dependent individuals who were sampled in order to discussion measures to reduce their car use. Transport stakeholders ranged from members of the public to local experts, such as transport consultants, transport operators, local council members and charitable organisations. As this empirical research study focused on a specific area, it was considered logical to focus on local rather than national policymakers. It was considered by achieving this sampled population this enabled this work to gain a broad understanding of how future transport planning strategies might be implemented to encourage and persuade individuals to reduce their car use.

OBJECTIVE 3: To evaluate a **range of future transport strategies and incentives** that might lead to a reduction in car use. In turn, informing future transport strategies to achieve local and national transport targets and to encourage decarbonised travel.

Firstly, Figure 3.1 provides an overview of the intention for each method in turn, discussing the benefits and limitations of each and providing alternative methods which could have been implemented throughout this study. This objective was initially achieved by questioning a sampled population of 392 participants. This allowed this work to capture a broad range of views along a specific travel corridor, which would have been unachievable interviews were used at this stage of the work. All of the sampled population were asked to describe travel strategies and incentives that they felt could reduce their car use the most, and were asked how their car use would change over eighteen FTS. A selected group of participants were then asked to take part in further research (i.e. travel diaries and interviews) in order to understand how the identified travel strategies and incentives could be introduced to the current transport network in the UK. Finally, five transport experts, who represented local transport groups and organisations within Birmingham, were asked to discuss theoretical practicalities and constraints towards each of the travel strategies and incentives proposed by the previous research participants. This allowed the study to identify FTS that were most likely to reduce the car use of individuals who were considered the most

car dependent, and to provide a detailed insight into some of the potential practicalities and constraints (i.e. financial or local governmental policy) that might prevail when implementing the FTS. The findings from this work should be used to inform transport stakeholders (e.g. planners and transport consultants) of the measures most likely to influence car use along this specific travel corridor.

OBJECTIVE 4: To **inform future transport strategies** to increase their acceptability to promote: a reduction in car use, alternative forms of transport and low carbon travel.

All participants were asked to describe strategies they would favour the most. It was considered that by allowing the participants to detail and describe FTS they would be more willing to accept them if they were introduced, as they had taken part in a consultation process and had an active stake in their development. Furthermore, in order to gain a detailed insight into aspects of a single FTS that were considered most prevalent to reduce an individual's car use, further discussions were held with a selected sampled group, and each participant had the opportunity to express, in their own words, how the identified FTS could be introduced. It was recognised that the findings of this work might not represent all travel users opinions but on the other hand, it has provided a viewpoint from a specific group of travel users in understanding which travel strategy might be more accepted if implemented and achieving the overall intention of this study to reduce individuals' car usage.

OBJECTIVE 5: Based upon the findings of this research study, make **recommendations for new transport planning strategies** that strive to promote a reduction in car use and enhance low carbon travel amongst different user groups.

Detailed discussions took place with a selected group of car users in order to understand which FTS would impact their car use the most, and with transport experts to gain an insight into the potential practicalities and constraints that could impact each identified travel strategy. This work has recommended tailored transport strategies for a specific area along an urban travel corridor and towards a specific car users group (car dependent), which has often been overlooked or isolated from previous transport studies. For example, this research found individuals who were defined as young or elderly (for the

purpose of this study) were more fearful of using public transport at night. It is therefore the intention, by developing strategies based on this empirical research and tailoring them to meet specific needs and demands of different demographic, to achieve low carbon targets, individuals will be more willing to reduce their car use in favour of alternative forms of transport, as they have had an active stake in the development of the transport strategies.

7.1.2 Key Research Findings

As outlined throughout this work the main aim of this study was to investigate the practicalities and barriers that might exist to reduce the car use of individuals who were recognised to have a strong association towards car use. This research study and its findings are unique and unprecedented, as it has gained an insight into the travel attitudes and behaviour of some of the most car dependent individuals within an area of Birmingham. After undertaking an extensive literature review (refer to Chapter 2) no research study was identified that has specifically focused on this area to understand how car dependent individuals might change their travel habits. This in turn has allowed this work to gain a detailed understanding and insight into transport strategies that could be developed in order to encourage a greater usage of alternative forms of transport and reduction in car use.

This contrasts with previous research studies that have typically not investigated individuals who are recognised to have a strong affiliation to the car. In general, previous research studies have focused on individuals who have typically shown willingness or acceptance to reduce their car usage; for example, those individuals who might walk or cycle to work within the summer (which are typically drier and warmer periods) but drive to work in the winter. Consequently, aspects of this study have previously not been investigated before, and therefore provide a distinct and useful insight into the development of transport strategies that aim to reduce car use targeted at individuals who have been recognised to be the most car dependent amongst different urban demographic characteristics. In addition, the research methods used for the purpose of this study, and the combination of a range of surveys and sources, allowed for a detailed understanding and fuller picture to become established in order to provide detailed analysis and recommendations for future transport policy development.

Notwithstanding the limitations of this study (for example, refer to Chapters 3 and Chapter 6, section 6.2), the findings have identified the need for immediate action in order to quell the current and projected trend throughout most inhabited societies towards an increase in car usage. The work has begun to extract key transport strategies to reduce car use amongst individuals who are heavily car dependent. To this end, there appears to be a continual battle against the preference towards the car for daily travel for most, which appears to have encapsulated and engulfed travel attitudes and behaviour.

The potential consequences of excessive car dependency have been well documented and acknowledged throughout this work. It is broadly recognised that transportation is a significant contributor to climate change and other broader environmental problems. However, for societies to become less reliant upon the car and to make this vision a reality rather than a utopian idea, transport stakeholders (e.g. policymakers, planners and transport professionals) need to begin a new chapter in transport strategies and engagement.

Due to the empirical nature of this study, a series of transport strategies and measures have emerged (refer to Chapter 6). This work demonstrated that different transport strategies had a different effect to different demographic characteristics. The burden to achieve a reduction in car use is therefore placed firmly upon transport planners and policymakers to develop transport strategies that might potentially be more universally acceptable in order to meet current transport needs, requirements and challenges - to not act against this transport burden is not a solution. Transportation is not an isolated problem. The effects of transport are holistic and interlinked, as they are known to affect every inhabited landscape and also have a detrimental effect on individual's health and wellbeing. It is within the grasp of planners, policymakers or transport users to influence the characteristics of future societies, but more so to shape and enhance tomorrows transport world for the potential benefit of future generations. Transport stakeholders must take account of the collective responsibility towards promoting low carbon futures. The environmental problems facing all societies must not be underplayed and a vast effort is required to tackle climate change and other impacts of transport. If stakeholders such as planners, policymakers and members of the public begin to tackle these problems, then surely, as a society, we can move forward in reducing the impacts transport has towards

climate change and other environmental and social problems. It has been demonstrated throughout this study the complexity embedded throughout the transport systems in order to develop FTS. Therefore, transport planners should plan with caution when implementing transport strategies, as how individuals use space and want to use space is continually evolving and changing – hence the need for continuous research.

It is worthwhile to recognise that the measures outlined in this work are part of a wider range of travel options to encourage a reduction in car use and some measures have been recognised to be easier to implement and require less finance support. The measures, when put as a package, as discussed in Chapter 6, can be separated into two broad distinct transport strategies. For example, hard transport strategies (i.e. segregated cycles) might require more negotiations between different stakeholders (e.g. members of the public, road users and local highways and transport officers) and take a longer time to implement. In comparison, soft transport strategies (e.g. increasing road awareness through education) could potentially be introduced in a shorter time-period and require less financially support and negotiation. It is worthwhile to note that there is no singular answer or solution to changing travel behaviour and attitude away from the car.

Today, urban landscapes appear to have become increasingly regulated by travel attitudes. Currently, we appear to be on autopilot set for environmental disaster and altering this path is in the interests of all inhabited societies, with the outcomes of the future resting at the controls of all transport stakeholders. However despite what appears to be an obsession with car use, this research has identified individuals are prepared to reduce their car use if the right transport strategies are implemented by transport stakeholders. Therefore this suggests a failure of current transport strategies and the need for new transport strategies to be developed in order to meet individual's travel needs and requirements. This was one of the strongest findings to be unearthed from this study as it was identified even the most car dependent individuals were found to be willing to reduce their car use if the right conditions are put in place. This conclusion was reached as a result of several elements of this study.

This empirical based research study has provided a greater understanding into transport behaviours and attitudes by gaining an insight into the preferences towards

preferred transport strategies in order to reduce car use amongst a specific group of car users along a specific travel corridor. The nature of this work has been uniquely different from previous studies. For example, it has not attempted to enforce transport policies onto a specific sampled population to influence their travel habit, in contrast, this studied has worked with a specific group of stakeholders to specifically design transport strategies which will influence their car use the most. In turn, this work has drilled down into understanding travel attitudes through the lens of individuals who are highly car dependent amongst different urban characteristics. In light of this research study, a number of key findings have emerged. The findings might have benefit to transport planners as this new empirical study has provided additional knowledge into a specific group of individuals. These are:

1) It is known that urban demographics characteristics influence travel attitudes and behaviours. However, it is unknown how they might impact on individuals who are highly car dependent. Based on the findings of this work, the characteristic age was revealed to have a significant influence towards travel behaviour and attitudes. However, it was not the only demographic characteristic to influence car use, as all demographics were found to influence travel attitudes and behaviours throughout this research study. This therefore suggests, transport stakeholders (e.g. planners and policymakers) should firstly considered the implications of age for future policy development but thereafter, take a holistic approach to encompass a broad range of FTS based to encompass different demographic characteristics.

2) There is a distinct gap between individual's awareness that their daily travel attitudes and behaviours are having on the environment and wider impacts, but also the cost of car use when compared to their daily actions. If levels of car usage are to be decreased, this research has shown there is a requirement for new transport measures in order to promote the benefits of alternative forms of transport to those individuals, who are typically car dependent. For example, most people who have a strong affiliation to the car are typically unaware of the financial benefits of alternative forms of transport. This is despite most of the sampled population showing a willingness to consider other transport options other than the car.

3) It is critical that an umbrella approach is not taken when planning for new transport strategies. This research has provided evidence that has shown different transport strategies will effect individual's travel attitudes and behaviours differently, despite them all being car dependent; something which was previously under investigated. Therefore, as a result of the findings of this work, it is recommended that new transport strategies should be tailored towards local demographics and travel attitudes and behaviour. In turn, this work has allowed for a greater understanding into how some transport strategies might influence car users who are considered most dependent on their car along a specific travel corridor, which was previously unknown. The findings of this study can therefore be used to develop future transport policy along urban travel corridors, which share similarities to the travel corridor sampled for this work.

4) There is appetite amongst individuals to reduce their car use if the right transport strategies are developed to meet individual's needs. This was despite the respondents in this work being recognised to be heavily car dependent and favouring the car as their current preferred method of transport. It was previously unknown, until this study, if there was a willingness amongst individuals who were recognised to be car dependent to reduce their car usage. The research findings are therefore encouraging for future national and local transport targets that aim to reduce car use and promote low carbon environments. As this research has uncovered evidence to indicate that the travel attitudes and behaviour of those individuals who have a strong affiliation towards the car are willing to reduce their car use if the right policies are introduced. This research has further addressed the gaps in transport research by better understanding car dependence and factors that contribute to it, something that was identified as requiring further research prior to this work.

5) Unlike previous research studies that have typically focused on those individuals who have a shown a willingness to reduce their car use, this study has focused on those individuals who are heavily reliant on their car for their daily travel use and are, on

the whole, unfamiliar or irregular users of alternative forms of transport. In turn, this has enabled this study to inform transport stakeholders, such as planners, policymakers and campaigners, from a new perspective of some key measures that may influence the car use of those individuals who have a strong association towards the car. Therefore, this has addressed the current research gap in transport literature that was identified in Chapters 1 & 2 (for example, section 1.5), which indicated further research was required to identify measures, which may support change (i.e. a reduction in car use) rather than provide information towards individuals who are highly car dependent.

6) Local transport experts in Birmingham, UK, currently acknowledged that new transport strategies are required to promote a reduction in car use and influence individuals' travel attitudes and behaviours. As a result of this work, a number of key strategies have been identified (refer to Section 6.4), which inform and provide recommendations for future strategies that might have the greatest affect towards reducing the car use of individuals. This is unlike previous work, as this work has focused only on individuals who are highly car dependent at a local level in order to understand transport preferences within a local community. This therefore validates the importance of continuous research in the field of transportation and the need for new policies in a specific area of the UK, and might be of relevance to others areas.

7.2 Recommendations for Future Research

As a consequence of this research study, a series of potential avenues for further research have been identified. It is the intention that each avenue will enrich and further ignite transport knowledge, debate and discussion. These are:

1) This research study was focused towards a specific urban travel corridor in Birmingham, UK. However, it would be worthwhile to investigate if the findings from this study would concur with a research study that explores the same demographic characteristics and similar sample population (e.g. those who are car dependent) who did not live within a close proximity to a travel corridor (e.g. a greater distance than one kilometre from a travel corridor or the adjacent

deprivation level to the travel corridor). For the purpose of this research, each deprivation area investigated was located no more than approximately one kilometre away, or adjacent from the investigated travel corridor. It is therefore logical to assume that all of the sampled population were within easy access to public transport services and this had the potential to influence the data. Furthermore, it would also be worthwhile to investigate an urban travel corridor in another area of Birmingham or region (e.g. Manchester or Bristol) to validate the findings from this work as it is accepted this work concentrated on an isolated travel corridor. In turn, by sampling a larger population this might have the potential to present a gain level of statistical reliability or at a minimum provide the opportunity to cross reference the results collated from this work.

2) It would be beneficial to explore the practicalities and barriers of the hypothetical FTS discussed with national transport experts in order to gain a national transport perspective rather than a local transport perspective. In turn, this would allow a comparison between the responses provided by local and national transport experts.

3) To explore how the use of future technology might influence car use behaviour. Researchers could explore the projected future relationships between technology and car travel attitudes, and to investigate how individuals might be willing to travel in the future in order to inform FTS.

4) To investigate and determine if the key outcomes unearthed from this research study would be applicable, useful and implemented for transport stakeholders (e.g. planners, policymakers and campaigners) outside of the United Kingdom (UK). In order to determine, the relationship between travel attitudes and behaviour of different backgrounds and cultures. It is recognised that a limitation of this work is that it focused a specific travel corridor. It is recognised that a limitation of this work is that it focused a specific travel corridor. It is therefore unknown how the results presented within this work could be transferable to other areas on a national or global scale thus further research is required.

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Appendix 1

UNIVERSITY OF BIRMINGHAM

Travel Questionnaire

Your household has been **selected at random**. Please could I ask for a member of your household for a few minutes of their time to complete this questionnaire in order for me to further understand travel habits in your area?

Please only complete this questionnaire if you;

- Are over the age of 18.
- Live at this address.
- Hold a full UK driving licence and have commuted using an automobile.

1. General Information

(please circle where appropriate)

Gender	Male Female
Age	_____
Address	House hold number _____ Post code _____
Occupation (*please also state, if you are currently unemployed e.g. receiving job seeks allowance/ Full/ part time student/ Carer etc)*	_____
Household income?	£ _____
Your standard weekly travel, how often do you use your automobile?	Every day Every other day Twice a week Once a week Other
Average daily commute (from door to door)?	_____ Miles
How long have you held a Full UK driving licence?	Full UK licence _____ Years
How many cars are registered at this address?	_____ Number of cars
What is your preferred method of transport (i.e. car, train)?	_____
Do you believe your automobile transport is contributing to climate change?	Yes No
Does your health affect your ability to travel?	Yes No
Are you registered disabled?	Yes No

2. Your travel habits
(please tick where appropriate)

How strong is your current automobile habit (AH)?

Very weak ☐ ☐ ☐ ☐ ☐ *Weak* ☐ ☐ ☐ ☐ ☐ *Very strong*

How easily could your current AH be broken?

Easily ☐ ☐ ☐ ☐ ☐ *Possibly* ☐ ☐ ☐ ☐ ☐ *Never*

From today, how do you predict your AH will change in…

5 years' time?

Decrease AH ☐ ☐ ☐ ☐ ☐ *No Change* ☐ ☐ ☐ ☐ ☐ *Increase AH*

10 years' time?

Decrease AU ☐ ☐ ☐ ☐ ☐ *No Change* ☐ ☐ ☐ ☐ ☐ *Increase AU*

15 years' time?

Decrease AU ☐ ☐ ☐ ☐ ☐ *No Change* ☐ ☐ ☐ ☐ ☐ *Increase AU*

Please list, three factors which affect your current AH?

1.

2.

3.

Has age affected your AH (if yes, please state why)?

Yes No

If yes _____

Has wealth affected your AH (if yes, please state why)?

Yes No

If yes _____

What incentives could be offered to reduce your AH?

Incentives _____

_____

Is your AH affected by individual members within your household (if yes, please state their relationship to you)?

Yes No

If yes, _____

_____

How would the following future scenarios affect your automobile habit?

3. Future travel scenarios *(please tick where appropriate)*	I would drive a lot less	I would drive less	No change	I would drive more	I would drive a lot more
No change to urban road structure	☐	☐	☐	☐	☐
Congestion charge implemented at £5 per day but cycle lanes and public transport facilities were commonly available	☐	☐	☐	☐	☐
Compulsory for all employers to provide shower and changing facilitates	☐	☐	☐	☐	☐
No change to your commuting distance but public transport and cycle lanes were commonly available	☐	☐	☐	☐	☐
All cycle lanes/ parking removed	☐	☐	☐	☐	☐
Elevated cycle lanes were commonly available	☐	☐	☐	☐	☐
Road tax increased by an additional £5 for the next three years	☐	☐	☐	☐	☐
No obligation for employers to provide shower/changing facilities	☐	☐	☐	☐	☐
Congestion charging scrapped after 3 years with no improvements to public transport or cycle lanes	☐	☐	☐	☐	☐
Fuel increased by 10p per litre for the next 3 years	☐	☐	☐	☐	☐
A weeks free trial was available to use public transport or hire a bicycle	☐	☐	☐	☐	☐

	I would drive a lot less	I would drive less	No change	I would drive more	I would drive a lot more
Public transport fares decreased by 25%	☐	☐	☐	☐	☐
Cycle parking was commonly available	☐	☐	☐	☐	☐
Automobiles were limited to 20mph for 3 years	☐	☐	☐	☐	☐
On road cycle lanes were commonly available	☐	☐	☐	☐	☐
Your commuting time increased by 30 minutes but cycle lanes and public transport facilities were widely available	☐	☐	☐	☐	☐
Your working hours were flexible	☐	☐	☐	☐	☐
Supermarket shopping was discounted by 5% if you used the home delivery service	☐	☐	☐	☐	☐
If none of the above scenarios affected your automobile habits please note a scenario which would affect your automobile habit	_____				

4. Future Research

Would you be prepared to take part in further research (please circle)? **Yes** **No** S1

If yes, please leave your name followed by your contact details either your postal address or e-mail address. ***Please also provide contact details if you wish to receive a summary of results from the questionnaire.***

Name *(Dr/Mr/Mrs/Miss/Ms or other):* _____

Contact details *(postal address or e-mail):* _____

Please return within <u>two weeks</u> upon receiving this questionnaire in the <u>pre-paid</u> envelope enclosed

Thank you for your time

Appendix 2

Appendix 3

Appendix 4

Appendix 5

UNIVERSITY OF BIRMINGHAM

Personalised Car Travel Diary

Please follow the guidelines below to complete this travel diary:

- Complete for **seven consecutive days** (i.e. Monday to Sunday inclusive).
- Only document your **car trips** *(a car trip – driving from one place to another, refer to example below).*
- Complete as **accurately as possible** providing as much in detailed information as possible.

Section 1: Your details (BLOCK CAPITALS)	
Name:	
Full address:	
Post code:	
Preferred contact details *(phone/e-mail):*	
Car Information: *Please provide details of the car you predominantly use.*	Make (i.e. Ford): Model (i.e. Focus GTI): Fuel type (diesel/petrol/others): Engine Size (i.e. less than 1.7 litres): Age of the car: (years, approx) Annual average mileage: (approx)
Diary start date:	
Diary finish date:	

Before completing this travel diary please see example below:

Example of completed travel diary

Day	Trip No	Description of your car trip i.e. purpose – work/commute, shopping, leisure or visiting etc.	Start (inc: time and road name/ institution)	Finish (inc: time and road name/ institution)	Total trip Length (M/KM approx)	Perceived trip cost (£)
1	*1*	*Left home for work but stopped off at the newsagents to buy a newspaper*	*7.00am Linthurst Newtown*	*7.10am Blackwell Road*	*1.5miles*	*£0.45*
1	*2*	*Left the newsagents and continued on my way to work - arrived at work*	*7.12am Blackwell Road*	*7.52am University of Birmingham*	*8.0 miles*	*£2.40*
1	*3*	*Left work but went to the gym directly after work*	*5.00pm University of Birmingham*	*5.39pm Bristol Road South*	*5.0 miles*	*£1.50*
1	*4*	*Left the gym and returned home from work*	*6.49pm Bristol Road South*	*7.10pm Linthurst Newtown*	*4.5 miles*	*£1.35*

Section 2: Your travel diary

Day	Trip No	Description of your car trip i.e. purpose – work/commute, shopping, leisure or visiting etc.	Start (inc: time and road name/ institution)	Finish (inc: time and road name/ institution)	Total trip Length (M/KM approx)	Perceived trip cost (£)

Day	Trip No	Description of your car trip i.e. purpose – work/commute, shopping, leisure or visiting etc.	Start (inc: time and road name/ institution)	Finish (inc: time and road name/ institution)	Total trip Length (M/KM approx)	Perceived trip cost (£)

Please attach additional paper if required – complete in the same format.

<u>THANK YOU</u> for completing this travel diary. I will contact you shortly to arrange an interview - results from this travel diary will be discussed.

Once completed please return by 31st March via e-mail [redacted] or in the pre-paid envelope enclosed.

Appendix 6

One-Sample Kolmogorov-Smirnov Test

DEP			AGE
1	N		42
	Normal Parameters[a,b]	Mean	61.05
		Std. Deviation	16.885
	Most Extreme Differences	Absolute	.260
		Positive	.118
		Negative	-.260
	Test Statistic		.260
	Asymp. Sig. (2-tailed)		.000[c]
2	N		46
	Normal Parameters[a,b]	Mean	51.72
		Std. Deviation	20.756
	Most Extreme Differences	Absolute	.189
		Positive	.129
		Negative	-.189
	Test Statistic		.189
	Asymp. Sig. (2-tailed)		.000[c]
3	N		50
	Normal Parameters[a,b]	Mean	53.56
		Std. Deviation	14.501
	Most Extreme Differences	Absolute	.145
		Positive	.105
		Negative	-.145
	Test Statistic		.145
	Asymp. Sig. (2-tailed)		.011[c]
4	N		44
	Normal Parameters[a,b]	Mean	56.77
		Std. Deviation	18.863
	Most Extreme Differences	Absolute	.260
		Positive	.125
		Negative	-.260
	Test Statistic		.260
	Asymp. Sig. (2-tailed)		.000[c]
5	N		42
	Normal Parameters[a,b]	Mean	53.52
		Std. Deviation	17.308
	Most Extreme Differences	Absolute	.085

		Positive	.075
		Negative	-.085
	Test Statistic		.085
	Asymp. Sig. (2-tailed)		.200[c,d]
6	N		36
	Normal Parameters[a,b]	Mean	47.58
		Std. Deviation	16.827
	Most Extreme Differences	Absolute	.149
		Positive	.124
		Negative	-.149
	Test Statistic		.149
	Asymp. Sig. (2-tailed)		.043[c]
7	N		38
	Normal Parameters[a,b]	Mean	47.58
		Std. Deviation	18.094
	Most Extreme Differences	Absolute	.166
		Positive	.105
		Negative	-.166
	Test Statistic		.166
	Asymp. Sig. (2-tailed)		.010[c]
8	N		36
	Normal Parameters[a,b]	Mean	50.64
		Std. Deviation	17.203
	Most Extreme Differences	Absolute	.189
		Positive	.106
		Negative	-.189
	Test Statistic		.189
	Asymp. Sig. (2-tailed)		.002[c]
9	N		30
	Normal Parameters[a,b]	Mean	45.10
		Std. Deviation	15.235
	Most Extreme Differences	Absolute	.093
		Positive	.089
		Negative	-.093
	Test Statistic		.093
	Asymp. Sig. (2-tailed)		.200[c,d]
10	N		28
	Normal Parameters[a,b]	Mean	34.61
		Std. Deviation	14.377
	Most Extreme Differences	Absolute	.213

	Positive	.213
	Negative	-.124
Test Statistic		.213
Asymp. Sig. (2-tailed)		.002[c]

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

d. This is a lower bound of the true significance.

K-S Test for all levels

One-Sample Kolmogorov-Smirnov Test

		AGE
N		392
Normal Parameters[a,b]	Mean	51.10
	Std. Deviation	18.193
Most Extreme Differences	Absolute	.136
	Positive	.082
	Negative	-.136
Test Statistic		.136
Asymp. Sig. (2-tailed)		.000[c]

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

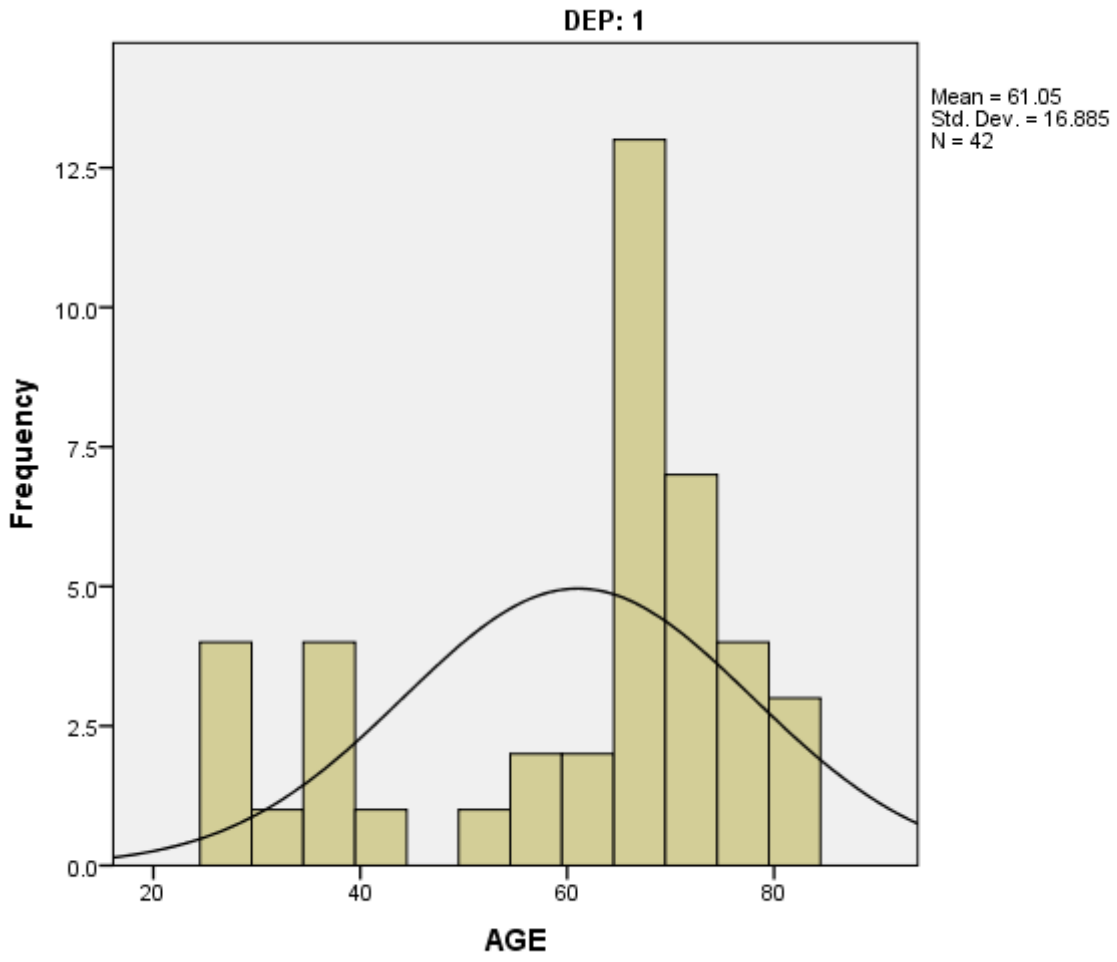
Spearman Correlation between age and car dependency

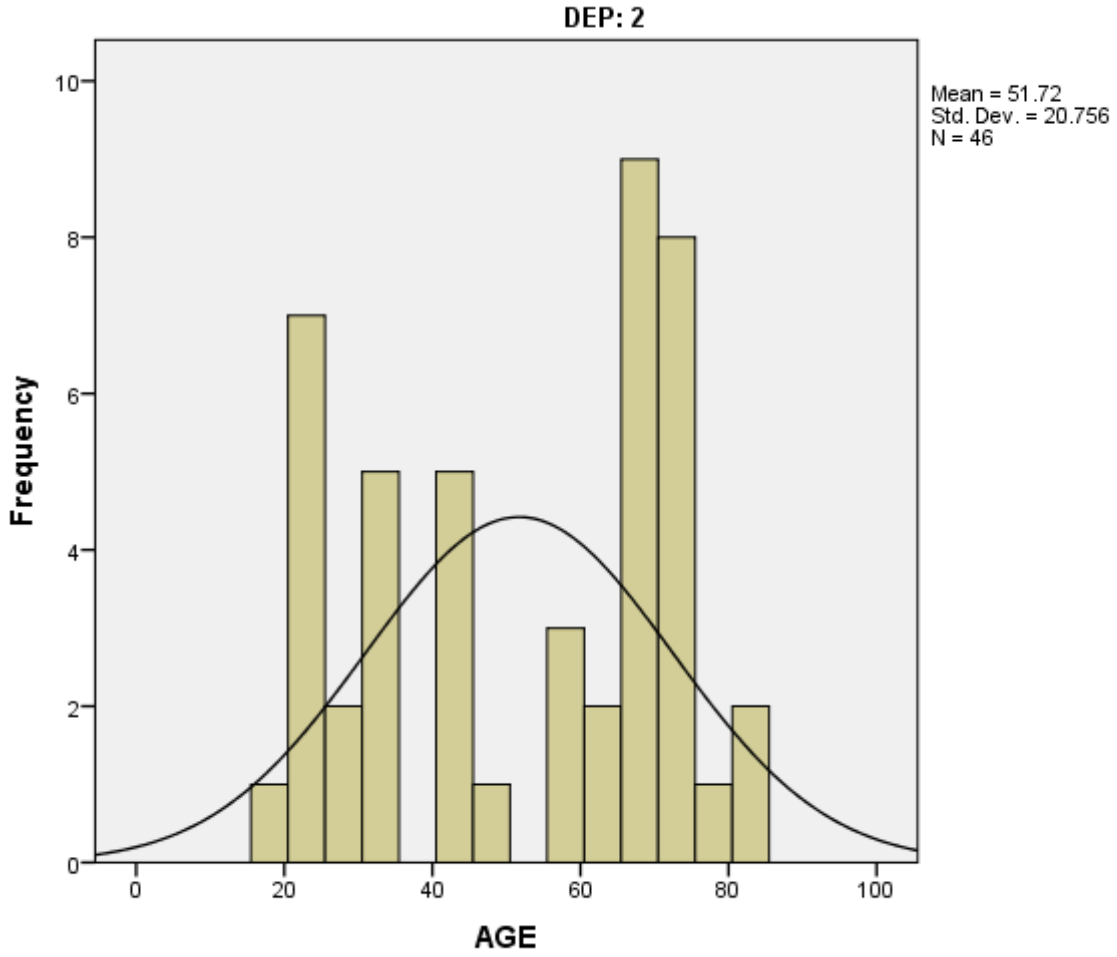
Correlations

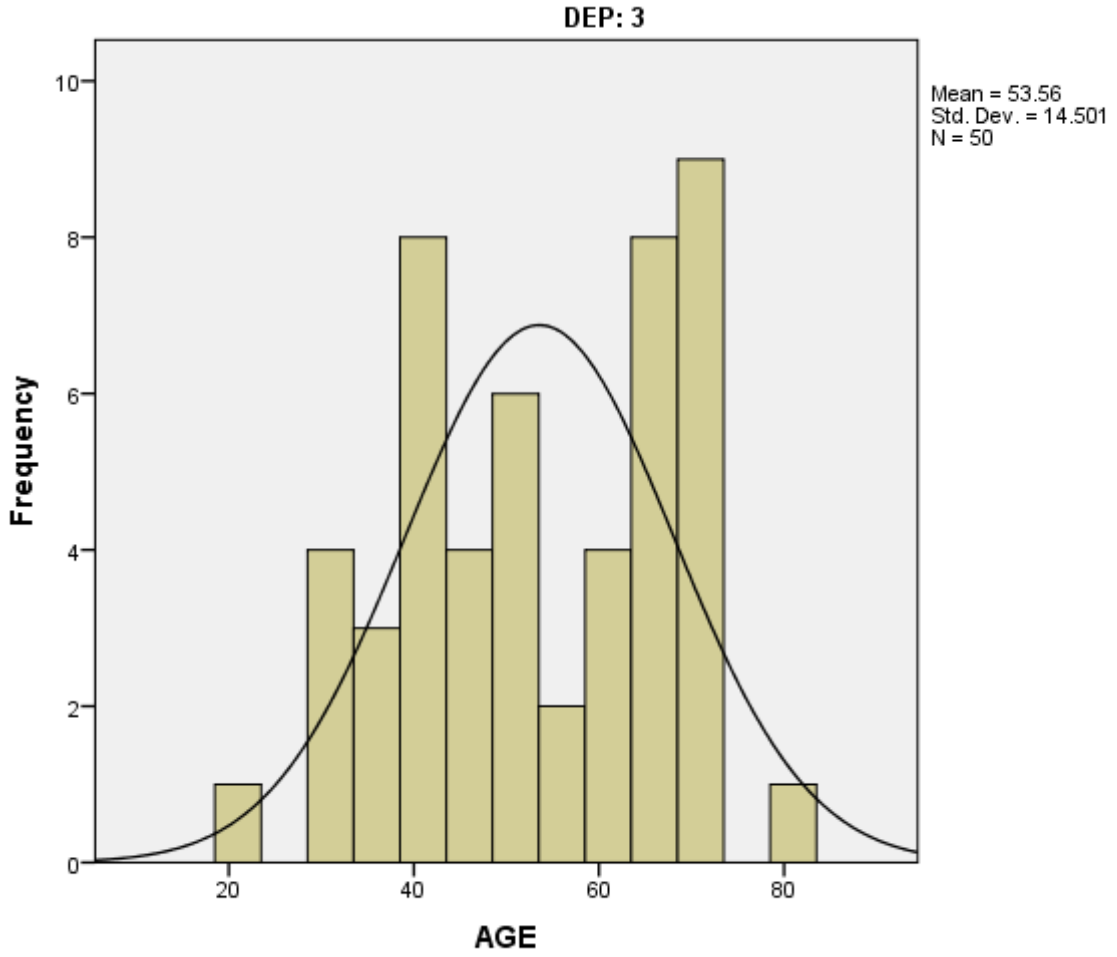
			age	car_dep
Spearman's rho	age	Correlation Coefficient	1.000	.450**
		Sig. (2-tailed)	.	.000
		N	392	392
	car_dep	Correlation Coefficient	.450**	1.000
		Sig. (2-tailed)	.000	.
		N	392	392

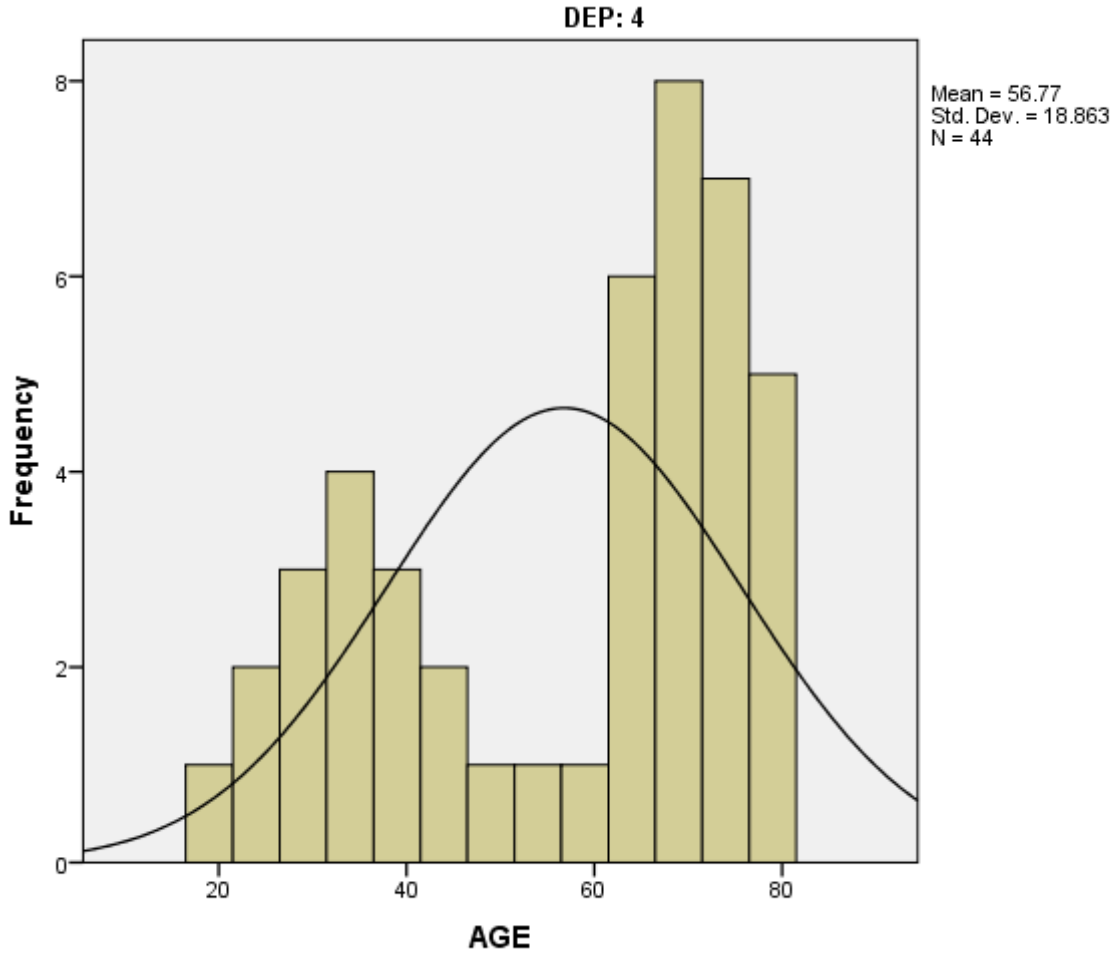
**. Correlation is significant at the 0.01 level (2-tailed).

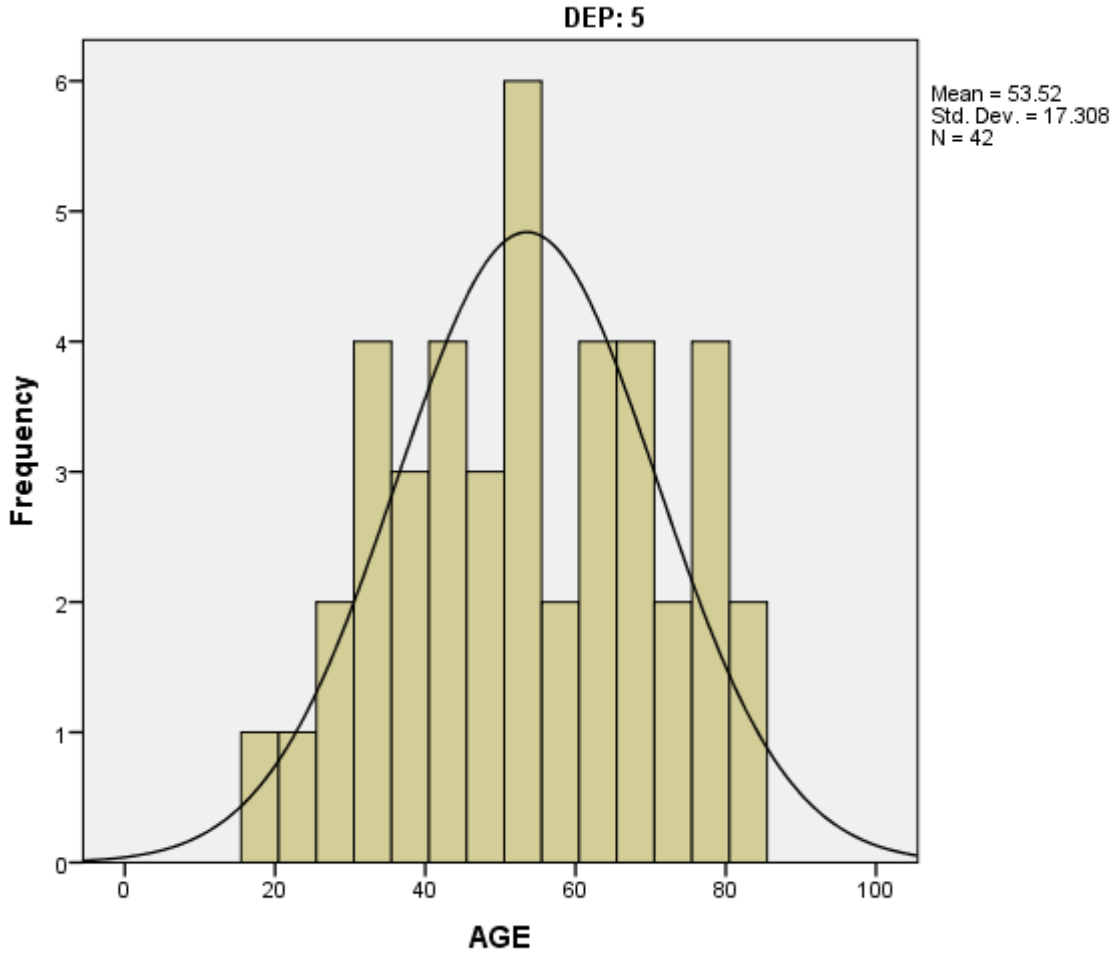
Histograms for each Deprivation Level

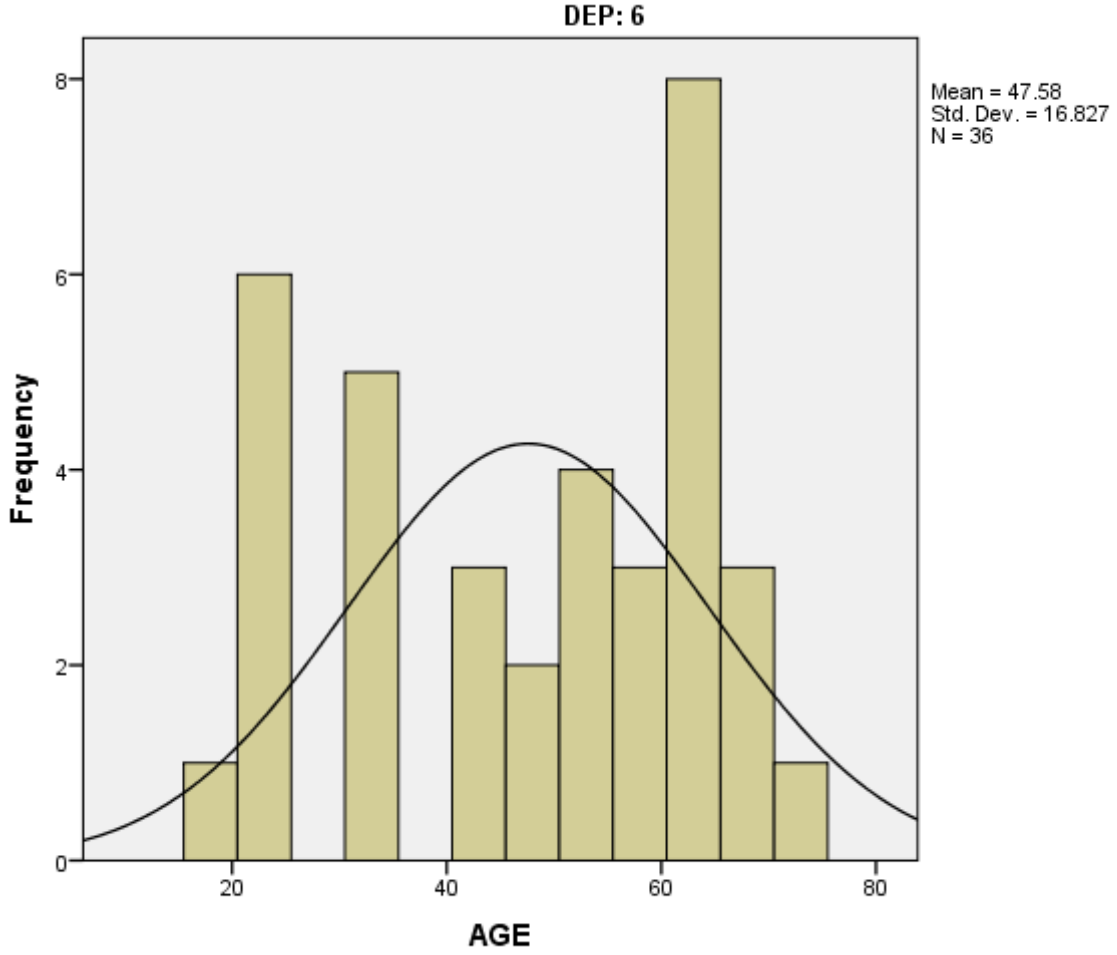



DEP: 2
Mean = 51.72
Std. Dev. = 20.756
N = 46
Frequency
AGE
0
2
4
6
8
10
0
20
40
60
80
100


DEP: 3
Mean = 53.56
Std. Dev. = 14.501
N = 50
Frequency
AGE
0
2
4
6
8
10
20
40
60
80


DEP: 4
Mean = 56.77
Std. Dev. = 18.863
N = 44
Frequency
AGE
0
2
4
6
8
20
40
60
80


DEP: 5
Mean = 53.52
Std. Dev. = 17.308
N = 42
Frequency
AGE
0
1
2
3
4
5
6
0
20
40
60
80
100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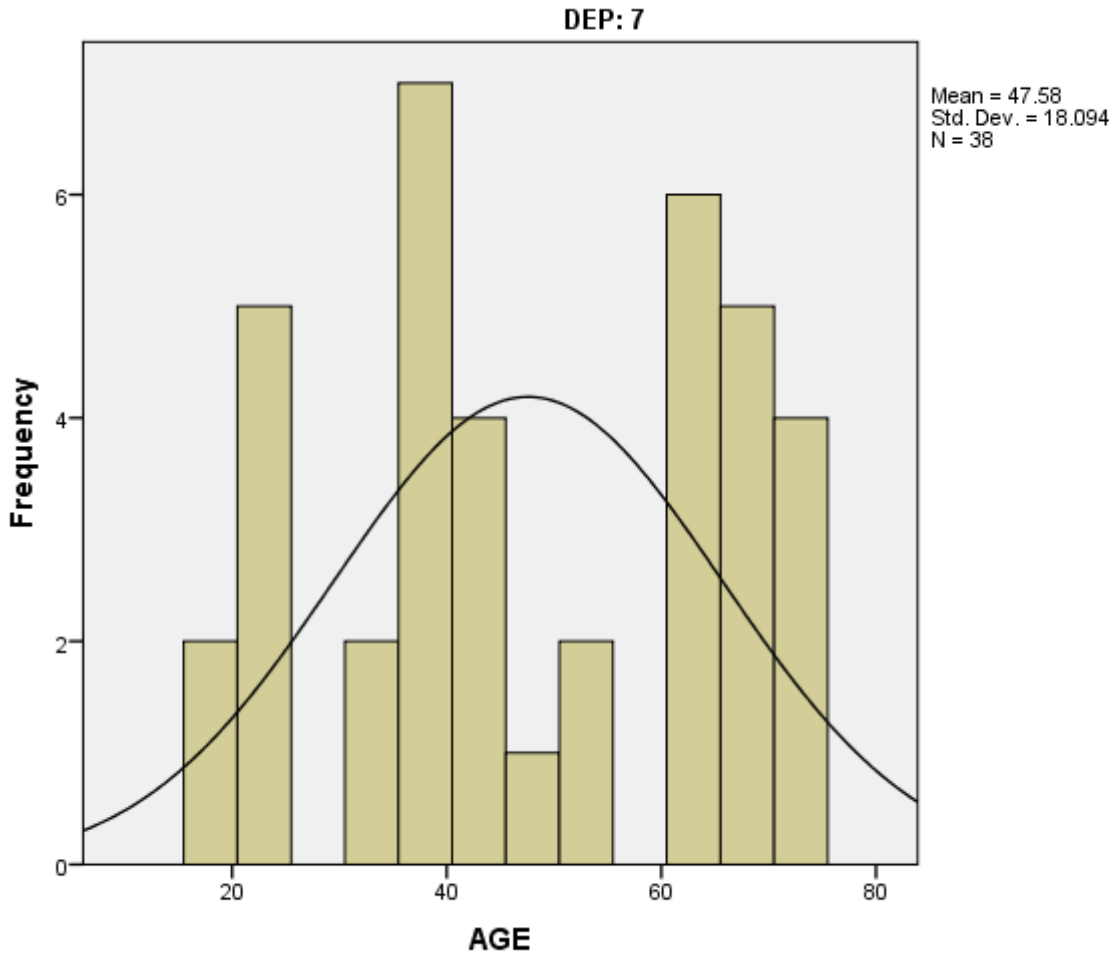
Mean = 47.58
Std. Dev. = 16.827
N = 36
Frequency
AGE
0
2
4
6
8
20
40
60
80


DEP: 7
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Std. Dev. = 18.094
N = 38
Frequency
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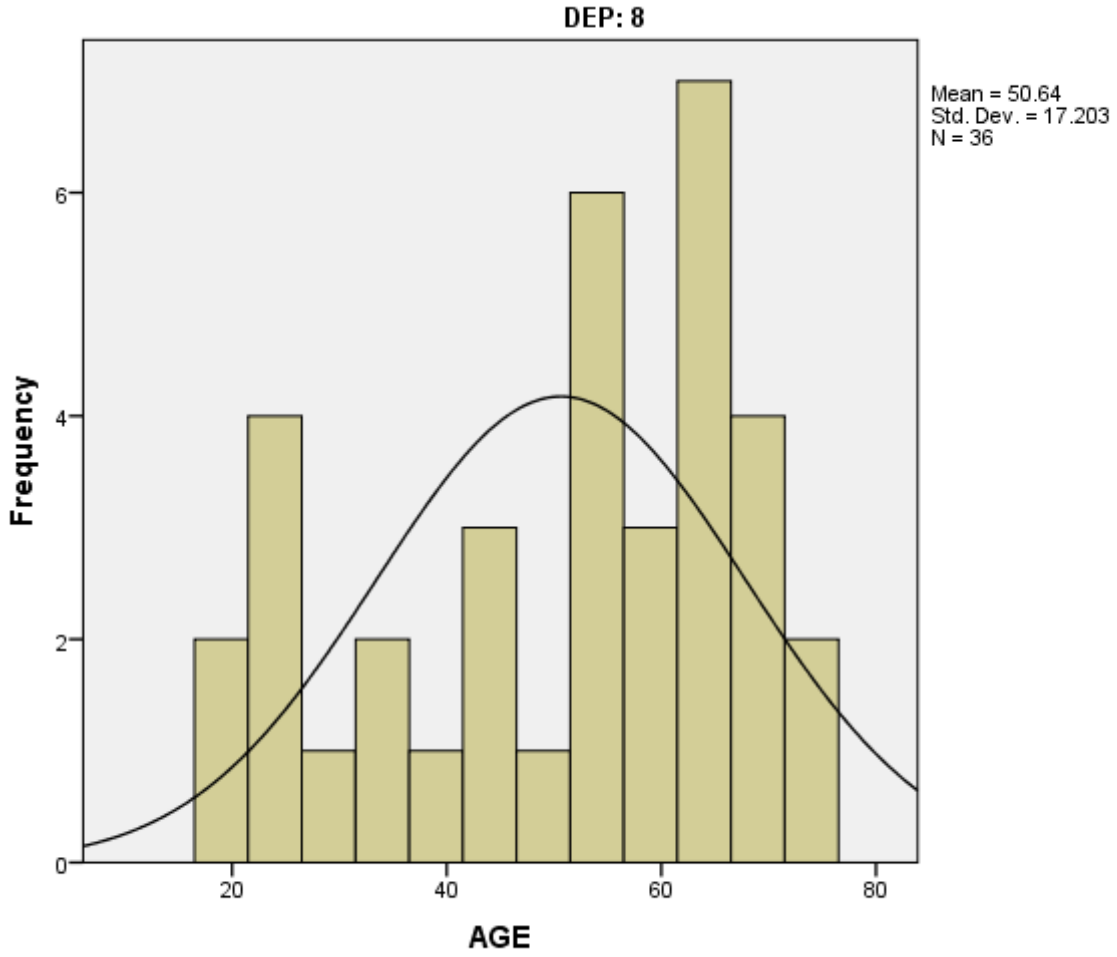
2
4
6
20
40
60
80
AGE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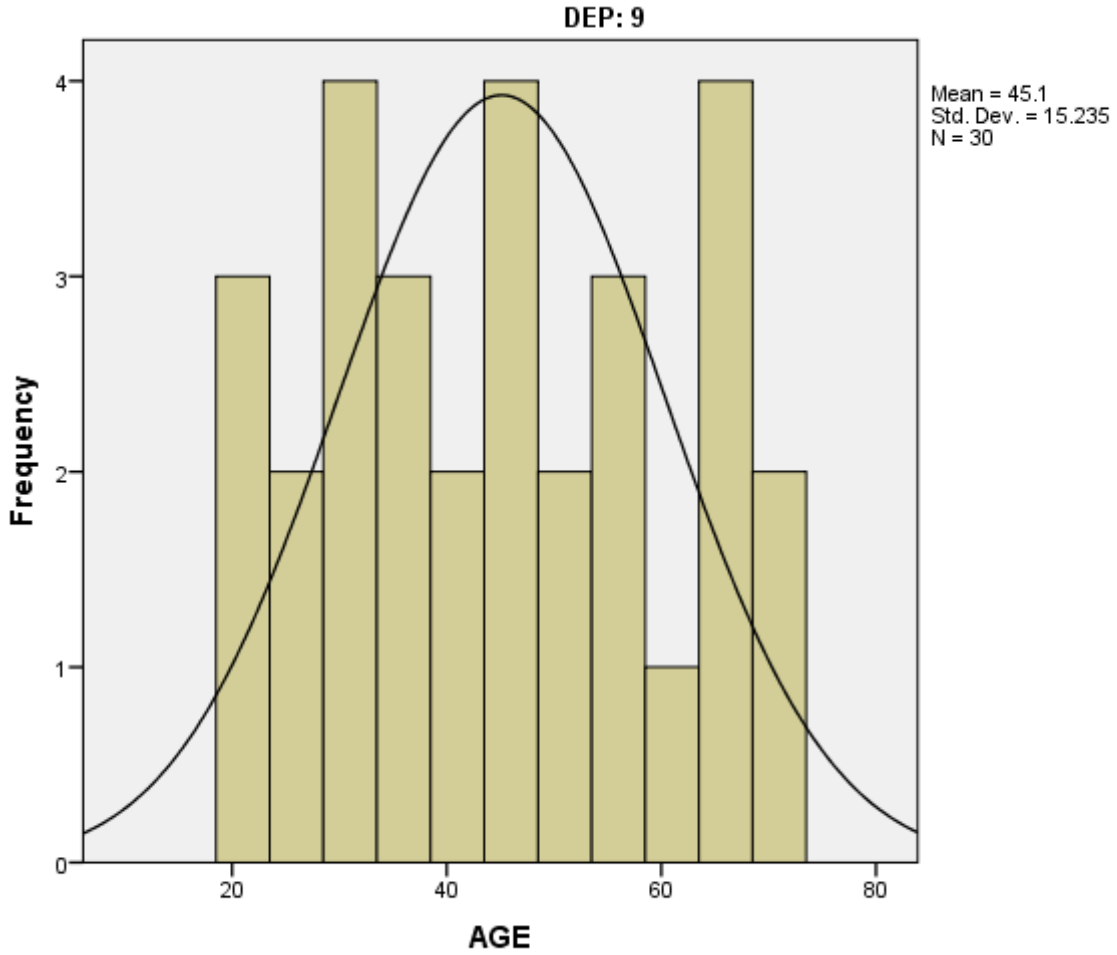
Std. Dev. = 17.203
N = 36
Frequency
0
2
4
6
20
40
60
80
AGE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Mean = 45.1
Std. Dev. = 15.235
N = 30
Frequency
AGE
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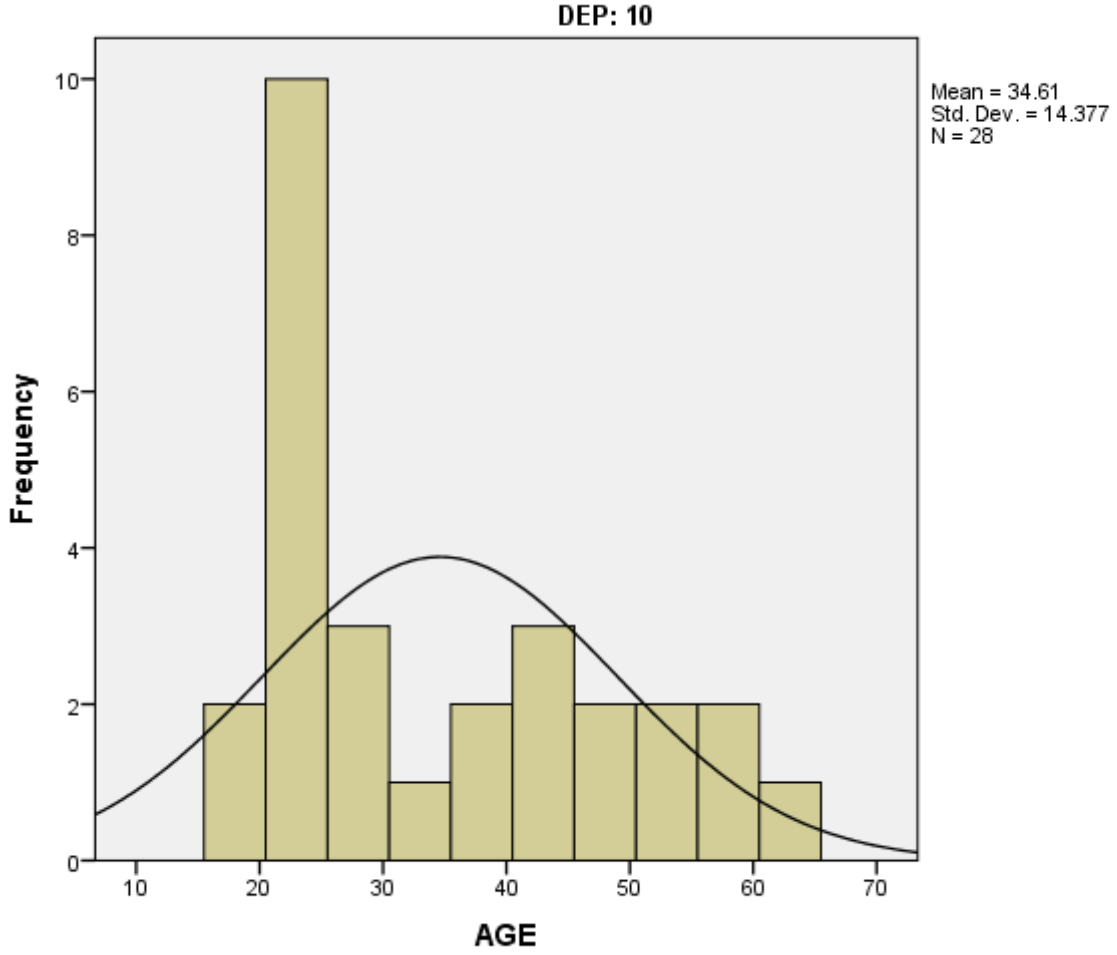
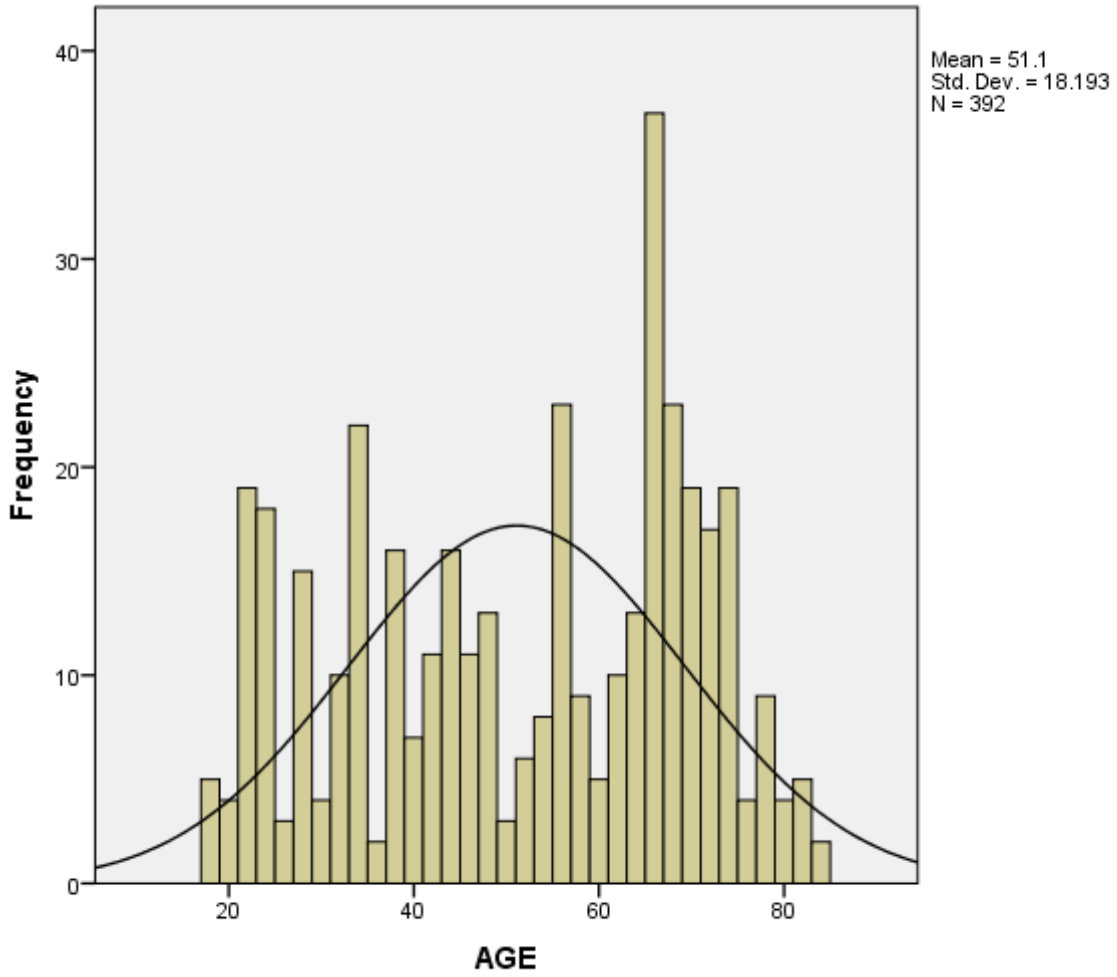
1
2
3
4
20
40
60
80


DEP: 10
Mean = 34.61
Std. Dev. = 14.377
N = 28
Frequency
AGE
0
2
4
6
8
10
10
20
30
40
50
60
70

Histogram for all Deprivation Levels



Appendix 7

UNIVERSITY OF BIRMINGHAM

Interview script – Developing new sustainable transport policies to reduce car use

1. Introduction

Hello, my name is Ashley Hayden. I am researching how new transport policies could be developed to reduce car use across different urban demographics (i.e. age, deprivation and gender). It is accepted, not all of the policies will have an effect on your car use.

Can I confirm?

- This is your travel diary *(show interviewee travel diary)* and it was completed prior to this interview?
- You are happy for this interview to be recorded (*participants must answer yes, otherwise, the interview will be suspended/terminated)?*
- **Recording starts**: **Recording finishes:**

During this interview, I would like to discuss the following topics: (i) general information concerning your car use (based upon your travel diary); (ii) imaginary future transport scenarios (FTS's) or incentives which might reduce your car use.

In turn, I will attempt to understand: the meaning of these FTS's/incentives to you; why certain FTS's/incentives seem to favour specific demographic groups and; how future policies could be developed to increase your ability/willingness to reduce your car use.

Brief notes will be taken throughout this interview. This interview is expected to last for approximately **1 hour**.

Key definition - Sustainable transport: A transport mode which offers an alternative to car use, at the same time, meeting the current needs of society without compromising future generations.

Interviewers use only: *Ask interviewee to complete the consent form - interviews will only proceed once the consent form is complete.*

2. Interview questions

Main Topic	Main Questions	Clarification Questions
1. General Information	What is your preferred name?	▪ Can you explain further? ▪ Why don't you use alternative forms of transport? • Does this travel diary reflect your normal weekly car use? If no, further discussion. • Explanation regarding modes of transport used.
	Confirmation of details: ▪ Occupation? ▪ General background i.e. parent/carer? ▪ Part/ full time? ▪ Is your car use either: every day, every other day or the car your preferred method of transport? If no, explore further.	
	Discussion/summary of completed travel diary.	
For interviewers use only: *Summarise and reconfirm*		

I would like you to imagine how the following FTS's/incentives *(list)* might affect your car use. All five FTS's/incentives have been shown to have the greatest effect to reduce car use (based upon a previous questionnaire listing 18 possible strategies - a short explanation will follow).

Interviewers use only: *If the participants says at any stage: "I would not reduce my car use" or similar - explore why?*

Main Topic	FTS's/Incentives	Additional questions/information
Future travel incentives or scenarios to reduce your car use?	2. **Cost:** Cheaper public transport.	▪ Based upon your perceived average daily travel cost for one day *(see travel diary).* How much cheaper must public transport be for you to reduce your car use and why? (see; table 1) ▪ What percentage would you reduce your car use and why? *Analysis - compare perceived cost to actual cost.*
	3. **Enforced congestion charging:** Congestion charging was introduced at £5 per day (use travel diary to inform you of a popular route) but, cycle lanes and public transport services were commonly available e.g. London (2).	▪ Show participant figure 2. ▪ How much prior notice would you expect before this policy was implemented i.e. days/weeks/months etc.? ▪ Would you favour using a: cycle lane; public transport service; both or neither and why? ▪ What features do you like and dislike from figure 2? ▪ If this policy was introduced how, why and when would it affect your car use? ▪ When would congestion charging have your acceptance? If never, why? ▪ By what percentage would you reduce your car use?
	4. **Cleanliness and Personal Safety:** Cleaner and safer public transport services (PTS's). *Is this an absolute measurement i.e. more bins required or a perception of cleanliness?* *Measures could include: more bins, don't drop litter signs.*	▪ What is cleanliness/security to you? ▪ Is the day of day a factor for you to consider safe? ▪ Have you ever used a PTS? ▪ If no, has cleanliness or security been a barrier to you for using PTS's? ▪ Why do you think PTS's are perceived to be unclean or unsecure – i.e. who informs you? ▪ Is cleanliness or security

		something that concerns you? If no/yes why. ▪ Can you suggest three improvements PTS's could introduce to improve safety or cleanliness? ▪ The improvements you have suggested were enforced, would you reduce your car use and by what percentage?
	5. **Transport realm:** No change to your commuting distance but public transport and cycle lanes were commonly available.	▪ Participants will be shown – figures 1 & 2. ▪ Do you agree public transport services and cycle lanes are commonly available in these figures? If no, please state why. ▪ What particular features do you like and dislike from figure 1? ▪ If your travel route *(take popular route from travel diary)* was similar to figures 1 & 2 would it have your acceptance to reduce your car use? If no/yes why? ▪ If this policy was introduced how, why and when would it most likely affect your car use and what percentage would you be prepared to reduce your car use?
	6. **Transport links:** Improved links between sustainable forms of transport (SFT). **A link** is the ability to interchange from one mode of transport to another i.e. the ability to take bikes onto trains/buses, improved cycle storage e.g. hubs.	▪ What factors do you think are important concerning links between SFT? ▪ Could you justify and give examples? ▪ If links between FTS's were improved (as you have suggested) would you reduce your car use, if yes, by what percentage?
	7. **Reflection *(repeat incentives):*** Had you previously considered any of the above incentives/FTS's?	▪ Knowing these incentives had the greatest impact to reduce car use does this surprise? If yes why, further explanation. ▪ Have you changed your

		mind concerning which policies may affect your car use? ▪ If no, could you explain further?
	8. **Reflection:** Would it be correct to suggest <u>X</u> (incentive/FTS) had the **greatest** affect towards reducing your car use? Would it be correct to suggest <u>X</u> (incentive/FTS) had the **least** affect towards reducing your car use? *Affect* will be measured by the reduction in car use (%) based upon per incentive/policy.	▪ Why? ▪ If none, why and can you suggest further FTS's or incentives that may reduce your car use? ▪ Participant
For interviewers use only: *Summarise and reconfirm*		

1. *Participants will be shown a scale of price reductions and asked to choose one – see figure 1.*
2. *Participants will be shown two futuristic cycle plans for London – Blackfriars and Tower Hill. Both proposals are similar to that of the 'Dutch style' cycle schemes.*

Table 1: A step by step guide for determining the meaning of cheaper public transport	
Steps/ questions	**Guidance for gaining the Information**
1. Determine the participants actually cost.	Automobile Associate of motoring cost 2014
2. Compare actual travel cost to perceived travel cost.	Perceived cost: Travel diary Actual cost: Automobile Associate of motoring cost 2014
3. Provide alternative choices other than the car i.e. the cost of the bus or train – suggest cost and times	WestMidlands Journey Planner website: http://jp.networkwestmidlands.com/centro/XSLT_TRIP_REQUEST2?language=en
4. Were you aware of the transport alternative?	
5. Knowing about the transport alternatives would you change your current use? If not, why not?	
6. Based upon their actual cost how much cheaper must public transport be and why?	

http://www.rome2rio.com/s/Minworth-Sutton-Coldfield-West-Midlands-B76-1XQ-UK/Birmingham-Birmingham-West-Midlands-B35-6BP-UK

Figure 1: A futuristic image of how Blackfriars Junction could look under new cycle plans.

Source: http://www.theguardian.com/cities/2014/oct/10/lobbyist-canary-wharf-london-segregated-cycle-lane-crossrail-bikes

Figure 2: A futuristic image of how Tower Hill could look under new cycle plans

Source: http://www.theguardian.com/cities/reality-check/2014/oct/10/-sp-reality-check-crossrail-for-bikes-segregated-cycle-lanes-london

Appendix 8

1. Introduction

Hello, my name is Ashley Hayden. I am researching how new transport strategies could be developed to reduce car use across different urban demographics (i.e. age, deprivation and gender). It is accepted, not all of the transport strategies (that are planned to be discussed in this interview) will have a direct relationship to you. The aim of the interview is to gain an understanding towards how practical you consider the transport strategies are for the future development of sustainable transport strategies in order to reduce an individual's car use.

Can I confirm?

- Are you happy for this interview to be recorded (*participants must answer yes, otherwise, the interview will be suspended/terminated)?*

- **Recording starts**: **Recording finishes:**

In total, I would like to discuss nine future transport strategies. The transport strategies discussed throughout this interview are based upon data collected from previous interviews (short explanation). Throughout this interview brief notes will be taken to aid the interview analysis. At no stage throughout the research will your personal details be documented in the thesis i.e. your name. It is expected for this interview to last for approximately **45 Minutes**.

Key definition – Alternative forms of transport: A transport mode that offers an alternative to car use but at the same time, meets the current needs of society without compromising future generations.

Interviewers use only: *Ask interviewee to complete the consent form - interviews will only proceed once the consent form is complete.*

2. Background

Main Topic	Main Questions	Clarification Questions
General Information	What is your preferred name?	▪ Can you explain further?
	Background info: ▪ Occupation? ▪ Recent projects you have been involved in? ▪ Description of your day to day role? ▪ How long have you been working in the transportation industry? ▪ In your opinion are we taking sustainable transport planning seriously in the UK?	
For interviewers use only: *Summarise and reconfirm*		

3. Future Transport Strategies

I would like to discuss how realistic and practical you perceive the following transport strategies. To reconfirm, the transport strategies that will be discussed are not based upon my own perceptions/opinions rather they are based upon previous research.

Main Topic	Main Questions	Probing/additional Questions
Potential strategies to reduce an individual's car use	1. **Financial Incentives:** To reduce the cost of public transport services? ▪ *To pay for a set number of journeys at a reduced rate within a set zone.* ▪ *Reverse on and off peak fares* ▪ *Free Public transport within a set zone (i.e. 5k)*	▪ Is Birmingham City Council doing enough to promote alternative forms of transport? ▪ Are planners or policy makers really interested in promoting alternative forms of transport? ▪ Why not? ▪ Can you please explain further? ▪ Proposed timescale? ▪ What changes would be required from the public and private sectors? ▪ Do you feel enough is being done to promote alternatives forms of transport (i.e. walking, cycling and public transport) in Birmingham? ▪ In your opinion how does future planning policy need to change?
	2. Segregated Cycles Lanes ▪ *Completely separated cycle lanes from other road users.* ▪ *Link together areas of significance such as employment, retail, residential.* ▪ *Maintained to a similar standard of the highway network*	
	3. Individually designed public transport services ▪ *Individually designed transport services based upon their travel routes i.e. an airport bus.*	
	4. Overcrowding ▪ *To increase the number of carriages;* ▪ *Standing only zones and;* ▪ *Increase the frequency of services*	
	5. Increase segregation ▪ *More zoned spaces on public transport routes i.e. mobile free zones, luggage zones*	
	6. Frequency and Reliability ▪ *A full money back guarantee made available if the service was delayed*	

	by more than 10 minutes – based upon a six month trial. ▪ *Operate later into the evenings (i.e. 12:00pm) and have a frequency of no less than every 15 minutes.*	
	7. Security Improvement ▪ *Increase the number of conductors on public transport service to enforce travel regulations.* ▪ *Decrease the number of unmanned train stations.* ▪ *Cluster together stations i.e. bus and train stations with the aim to improve connectivity between alternative transport links but to also improve security.* ▪ *Improve street lighting around public transport stations.*	
	8. Education ▪ *Promotional days within Schools, Colleges and Universities with the broad aim to promote the benefits of alternative forms of transport disseminating elements of road safety.*	
	9. Highway Code ▪ Disinvest in highways for the car e.g. reduce road width for more cycle lanes and in turn, actively invest in highways for alternative forms of transport thus marginalising car users.	
For interviewers use only: *Summarise and reconfirm*		

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Is Reducing Car Use a Utopian Vision?

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Abstract

Most urban environments appear to marginalise alternative forms of transport e.g. walking or cycling. New planning strategies are required to promote a reduction in car use and low carbon travel. This paper aims to inform sustainable transport planning strategies examining the effect urban demographics might have towards car usage. Research involved questionnaire surveys distributed to a sample population in Birmingham, UK. Results suggested that individuals indicated a strong dependency upon car usage despite two thirds recognising the contribution of car use to climate change. Data indicated car use was linked to age and there was a willingness amongst participants to reduce car use.

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Keywords: Transportation; Attitudes; Sustainability; Car use; Policy development

1. Introduction and background

Daily images of global climate change (GCC) through the media appear to have increased individual's awareness and intensified debates around how societies consume energy, in particular related to transport activity, as outlined by Omer [1]. Abulfotuh [2] indicated that GCC has become such a concern that the notion of achieving sustainable levels of greenhouse gas emissions has become a post-millennium development goal. Consequently the term sustainability has rapidly become interwoven across a wide range of disciplines including social, environmental, political and economic sciences. From relevant literature, the holistic nature of the term sustainability is easily recognized, for example, the links between sustainability and health e.g. Cavoli et al. [3] Pucher and Dijkstra [4] or to the built environment and equity e.g. Lucas et al. [5] Crane and Scweitzer [6]. Achieving sustainable development is a worldwide goal yet still transport authors suggest the term lacks clarity and definition as outlined by Elliott [7] and Lombardi et al. [8]. For the purpose of this paper, sustainable transport development is concerned with future transport strategies which might encourage a significant reduction in car use by promoting the use of alternative forms of transport (for example, an increase in walking, cycling and public.

transport use). Simultaneously, future transport strategies must attempt to meet the needs and requirements of those in society without inhibiting the wellbeing of future generations.

Balbus et al. [9] identifies transport as one of the greatest global contributors to GCC. The transport sector contributes to approximately one-quarter of the total anthropogenic Carbon Dioxide (CO_2) emissions from a United Kingdom (UK) and global perspective. Furthermore Tight et al. [10] predict that CO_2 emissions from transport are set to worsen over the coming years and decades. For example, Marsden and Rye [11] indicate that future transport CO_2 emissions will rise by 5% before 2020, in the UK, as the predicted demand for private car use continues to increase. Pietzcker et al. [12] suggest further CO_2 emission levels globally are to double by 2050 (based on 2010 levels). The UK government has responded by setting an across the board environmental target of an 80% reduction in CO_2 emissions by 2050 based upon 1990 levels. However, to achieve this, Geels [13] highlights it is a prerequisite for deep structural change regarding how societies consume transport. At the same time, Hickman et al. [14] show a predicted rise in global population, increased averaged incomes and material consumption which further complicates the difficulty in order to promote and enhance sustainable transportation throughout societies.

Hannam et al. [15] and Tight et al. [16] have explored and conceptualization future visions for transportation. They suggest alternative urban realms to promote a greater usage of alternative forms of transport and evaluate different methods of transport for different groups of individuals (i.e. people who live in urban and suburban areas). However recent research by Chatterjee et al. [17] indicates there still seems a lack of understanding concerning what triggers travel behavior and how travel habits might influence travel amongst different groups of the population. It has been argued that technological advances will cure and help to achieve local, national and global CO_2 emission targets. However, Brand et al. [18] advocates technological solutions still remain poorly conceived when compared to incumbent technologies with extensive investment, research and development still required. For example, Larson et al. [19] conclude that electric cars are currently perceived to be too expensive and inaccessible for the mass market therefore making them an impractical option for individual's daily travel needs and requirements. Previous transportation planning policy research by Bristow et al. [20] has called on policymakers to pay greater attention towards personal land-based transport. In turn, Banister and Hickman [21] argue this has given rise to a transport planning gap known as an *'implementation gap'* between different stakeholders (e.g. decision makers and members of the public).

Sustainable transportation has moved up the political agenda within recent years to the extent it has become an integrated part of local and national government policy (Banister and Hickman [21] Gudmundsson et al. [22] Goodwin [23]). Successive governments in the UK have introduced a number of policies that have aimed to promote the use and uptake of sustainable transportation, for example, the Climate Change Act (2008), Creating Growth, Cutting Carbon: Making Sustainable local Transport happen (2011), various White Papers e.g. Cutting Growth Cutting Carbon (2011) and more recently the Infrastructure Act (2015) which has led to the draft framework of the cycling and walking investment strategy (2016). However, despite national or local transport policies that have attempted to promote the benefits of alternative forms of transport such as walking, cycling or public transport services there still seems reluctance amongst different demographic groups of society within the UK to use alternative forms of transport. The UK's Census (2011) reported 70% of all journeys to work are trips are made by the car, reemphasizing our dependency upon car use.

This paper describes part of a research project which aims to inform future transport planning strategies to enable a reduction in car use and promote low carbon transport within the medium term (i.e. 2050). The research focuses upon work carried out to investigate how urban demographics (i.e. age, deprivation and gender) may affect the future development of sustainable transport networks amongst groups of individuals who are highly car dependent. The overarching research objectives were as follows:

1. *To investigate how car use might change across different levels of deprivation along an urban travel corridor in Birmingham, UK.*
2. *To conduct a mixed methodology approach consisting of questionnaires, travel diaries and interviews to determine the potential impact urban demographics might have towards car use.*
3. *To engage with a range of urban demographic stakeholders to understand how future transport planning strategies may have the potential to reduce car use enhancing the development of low carbon networks.*

4. *To investigate a range of future travel strategies which might lead to a reduction in car use amongst individuals who are highly car dependent with the intent to inform future implementation of transport planning strategies.*
5. *To develop future transport planning strategies which have widespread acceptance across different urban demographics in order to promote a reduction in car use and pursue low carbon transport infrastructures.*
6. *Based upon the findings of this research inform new sustainable transport planning strategies how to potentially promote a reduction in car usage.*

2. Method

A mixed methods approach was adopted for this study and it utilized three methods namely: questionnaire surveys, travel diaries and interviews. This paper focuses solely upon the results collected from the questionnaire survey.

2.1. Distribution of the questionnaire

A total of 3,000 travel questionnaire surveys were distributed by hand to households across 20 Lower Layer Super Output Areas (LSOAs). LSOAs are small geographic areas in England and Wales that typically have a population of 1,000 to 1,500. Each household received one questionnaire. All LSOAs were approximately located no more than 1 kilometer (km) of a major urban road corridor in Birmingham (see Figure 1). Questionnaires were distributed over a 12 day period in May 2014. LSOAs were selected based upon a stratified random sampling method. In total, 20% of the households in the surveyed area that consisted of 13,666 households received the questionnaire survey, which was considered a reasonable sample size (Baker et al. [24]). Upon selecting the individual LSOAs, all road names were collated then alphabetically ordered and numbered (in accordance to their alphabetical rank). A random number generator was used to determine which roads should receive a questionnaire survey. It is worthwhile to consider that this study was based upon a case study that was within an area which was predominately orientated towards the car. Therefore the findings of this research might have been dissimilar if conducted in an area that has greater acceptance towards alternative forms of transport (i.e. London and Oxford). However, this research study deliberately chose an area where car use was high in order to explore how possible it might be to bring about change in such an area – much work to date has looked at the 'low-hanging fruits', however, to make a real difference in transport we will need to go beyond these.

2.2. Techniques to improve response rate

It is widely acknowledged that postal surveys typically have a low response rate for example refer to Shannon and Bradshaw [25] and Fan and Yan [26]. As a result, it was anticipated that there would be a low response rate from the travel questionnaire surveys. To enhance the questionnaire response rate participants were offered the opportunity to take part in a prize draw (consisting of gift vouchers) and provided with a pre-paid envelope to return their responses. Previous research by Sahlqvist et al. [27] and Scott et al. [28] showed that both strategies have been helpful to improve the response rate of postal surveys. Furthermore, it is widely accepted, that the use of online platforms such as SurveyMonkey are a valid means of enhancing a questionnaire response rate. Deutskens et al. [29] suggests typically online surveys achieve a response rate that is between 25 – 35%. However, unlike postal surveys, online surveys cannot target specific households and may isolate individuals who cannot access or know how to use the internet.

2.3. Target audience and criteria

The questionnaire survey aimed to collect a wide range of travel opinions. The questionnaire surveys were delivered inside a blank envelope and contained the following, a participant information sheet, a consent form and a pre-paid envelope. Before participants responded to the questionnaire, they were asked to meet the following criteria: equal to or over the age of eighteen; lived at the address where the questionnaire was distributed; and held a full UK driving license. LSOAs of participants were distinguished by a discreet geographic reference placed in the top right hand corner of each questionnaire. This allowed for each questionnaire (if necessary) to be traced back to the area where the participant lived.

Deprivation was measured using the English indices of deprivation outlined by the Department for Communities and Local Government [30]. For the purpose of this paper, the Index of Multiple Deprivation (IMD) was ranked on a ten point scale. A score of one indicated the least deprived area whereas a score of 10 indicated the most deprived area. The IMD domains are based upon the Department for Communities and Local Government [30] which states the following measurements: income; employment; health and disability; education, skills and training; barriers to housing and services; living environment; and crime. Previous research studies have suggested deprivation affects car use (e.g. Atkinson and Kintrea [31] and Gatersleben [32]).

2.4. Questionnaire design

The questionnaire survey was split into four main sections, with a number of sub-headings as follows: General Information, Your Travel Habits, Future Travel Strategies and Future Research. The questionnaire survey primarily consisted of closed questions to allow participants to easily and quickly respond. However, open questions were used to gain further understanding into an individual's car attitudes. Initially participants were asked to provide information about themselves, for example, their age, gender and household income to gain a general background of individual participants but also to determine if they provided a fair representation of their sampled area. Secondly, participants were asked to provide information concerning their travel habits. This allowed for key travel indicators to be gathered that aimed to compare the potential influence urban demographics may have towards individual's travel attitudes. Penultimately**,** participants were asked to indicate how a series of hypothetical future transport strategies may affect their car use. The results were then compared against different urban demographic characteristics. For each future transport strategy, participants were asked to provide a response on a scale of 1 to 5 associated with the amount by which their driving habit would be influenced by the strategy. A score of 1 indicated the participant would be willing to drive a lot less whereas a score of 5 indicated the participant would drive a lot more. It was anticipated that not all of the future transport strategies would be of relevance to every participant as the questionnaire targeted a broad sample population. Therefore if a participant did not respond to a question this was not considered in the final analysis. In addition, there was a potential participants might not understanding the scoring strategy. Mean values were used to indicate which of the future transport strategies may have the greatest potential effect to reduce an individual's car use. Previous research by Gorard [33] has suggested that using mean values is a valid means of providing an accurate description and overview of the entire data. Lastly, participants were asked to indicate if they would be prepared to take part in further research (i.e. travel diaries and interviews).

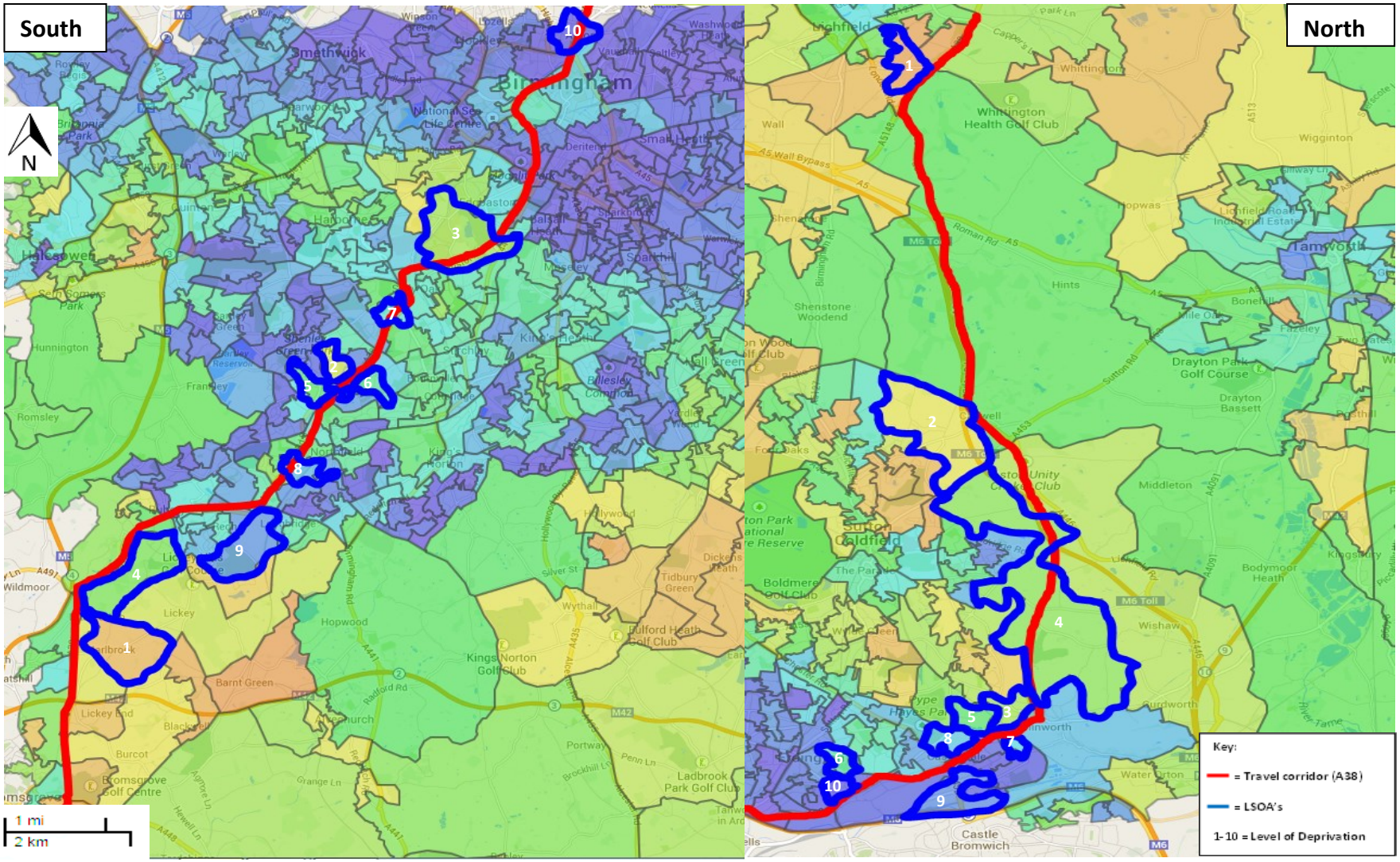

Fig. 1. The sampled LOSAs along the A38 Birmingham, UK.

3. Results

3.1. General overview of data

In total, 392 questionnaire surveys were returned before the specified deadline (1 July, 2014). The questionnaire achieved a 13% response rate which is similar to that of previous research, for example Edwards et al. [34]. Of the 392 respondents, 60% were employed, 24% were retired and the remaining 16% were not in paid employment (i.e. a house wife/husband, unemployed or student). Altogether, 28% of the respondents agreed to take part in further research. An uneven distribution of responses between deprivation levels was gained. For example, a greater number of responses were gained from wealthier areas as opposed to poorer areas. Therefore the findings may reflect more about travel attitudes in less deprived areas compared to deprived areas. However, on the other hand, as responses were gained from each deprivation level it was considered this allowed this study to gain an insight into travel attitudes across all ten derivation levels. Table 1 summarizes response by deprivation.

Initially, a test for normality was conducted using the Statistical Package for the Social Sciences (SPSS). A skewness value of – 2.41 was observed (for normal distribution skewness should range between -2 and +2). The data suggested that there is a negative skewness towards older age ranges. Further statistical analyses utilized nonparametric methods in order to determine if there were significant relationships between urban demographic characteristics and car use.

Table 1. General overview of response rate by levels of deprivation

Deprivation Level	Questionnaires Delivered	Questionnaires Returned	Response Rate %	Agreed to Further Research
1 (least deprived)	300	42	14	14
2	300	46	15	14
3	300	50	17	15
4	300	44	15	13
5	300	42	14	8
6	300	36	12	14
7	300	38	13	11
8	300	36	12	14
9	300	30	10	5
10 (most deprived)	300	28	9	5
SUM	3000	392	13 (average response rate)	113

3.2. Initial interpretation of results

The general information about a participant obtained from the questionnaire survey was used to gain an insight into a participant and to determine if the participant was a fair representation of the level of deprivation they represented. Census data was used to determine if the participant was a fair representation. Of the sampled population, 86% indicated the car was their preferred method of transport with over four fifths of respondents stating they either used their car on a daily basis or every other day. This was despite two thirds of participants

accepting their current car use contributed towards climate change. A Spearmen's rank test was conducted to determine the statistical relationship between age and car dependency. The results showed a highly significant relationship (p = <0.001) between age and car dependency. No other urban demographic characteristic indicated a significant relationship when compared to car dependency. Similar findings have been suggested by others e.g. Davey [35] and Kuhnimhof et al. [36].

To inform future transport planning strategies it was deemed critical to establish how individual's car use might change over time (i.e. within 15 years' time from now). As shown in Figure 2, the results suggest that within a 5 year time period the majority of the participants (52%) expected there to be no change in their car use. However over a greater time period (i.e. of 10 years or more) participants indicated that they would be willing to consider a reduction in their car use. For example, 63% predicted their car use to decrease in 15 years' time. Justifications for a predicted reduction in car use included increase in age (i.e. health problems) such as a lack of mobility or a change in shopping habits (i.e. an increase in internet shopping). Interestingly no participants stated environmental reasons despite there being recognition of the potential environmental causes of excessive car use. Furthermore, Figure 2 suggests there is willingness amongst the sample population to reduce their car use. The findings therefore might suggest that current transport planning strategies are acting as a potential barrier towards individuals who have a desire to want to reduce their car use and that new transport strategies need to be developed.

In addition to establishing individual's potential willingness to reduce their car use it was deemed critical to

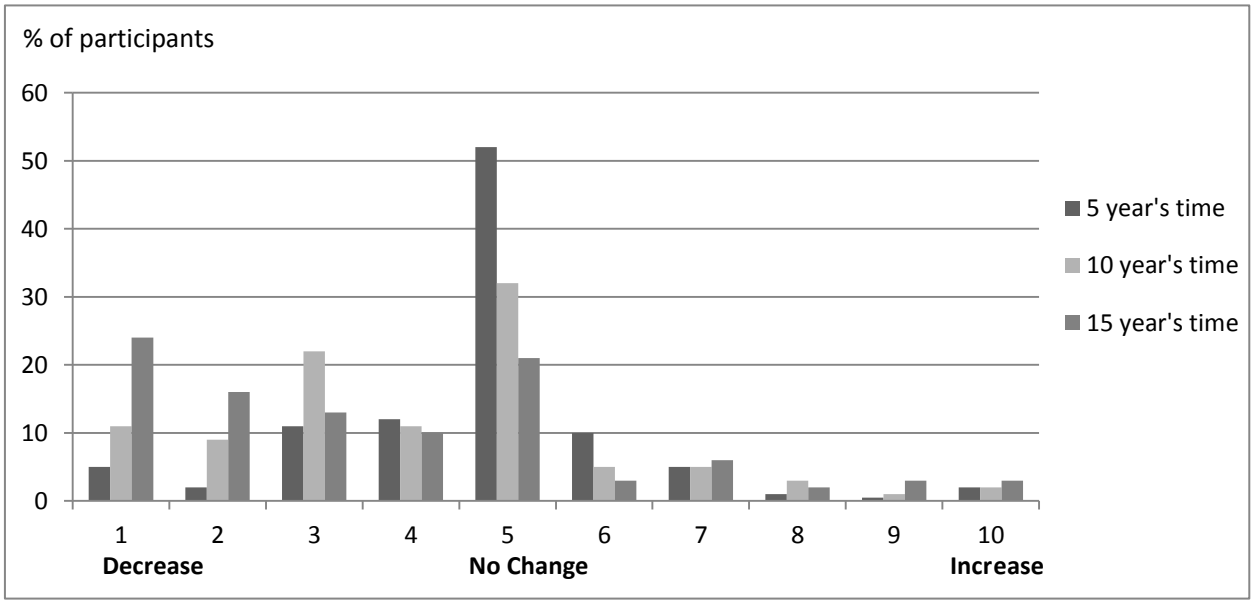

Fig. 2. Predicted car use over a 15 year time period

explore potential travel factors that might currently influence an individual's car use. Participants were asked to state three travel factors that related to their travel which affected their car use the most. Table 2 indicates a number of key travel factors such as, flexibility and convenience, employment, health or family commitments (i.e. taking and collecting children from school). Table 2 suggests different urban demographic characteristics affect car attitudes and reinforces the need for transport planners or policy makers to pay greater attention to urban demographic characteristics when developing future transport planning strategies to reduce car use. For example, health or the cost of driving (highlighted in ***bold italics*** see Table 2) seemed to only affect individuals who lived in areas with deprivation levels 1-3, who were over the age of 65 or were under the age of 25. They are highlighted in bold as they seemed only to be confided to those demographic groups and only affect them.
Furthermore, the information in Table 2 could be used to inform planners and policy makers of potential key indicators that are most likely to influence an individual's car use across different sub-sections of demographic characteristics. Table 2 indicates there is no one solution towards developing transport planning strategies as a multitude of travel factors are highlighted to influence individuals car use across different urban characteristics. Therefore, it is imperative that future planning strategies consider a bottom up approach rather than a top down approach reconfirming previous research by Greed [37]. It is worthwhile to highlight that Table 2 is a starting point in understanding potential travel factors to influence an individual's car use over different urban demographics and further research should attempt to build upon this data in order to enhance knowledge and debate.

Table 2. Comparison of the top three stated travel factors to increase individuals car dependency by age, gender and deprivation levels

	Urban demographics							
	Deprivation level			**Age**			**Gender**	
	1-3	**4-7**	**8-10**	**Under 25**	**25 – 65**	**Over 65**	**Male**	**Female**
First highest stated factor	Flexibility/ Convenience	Flexibility/ Convenience	Family Commitments	Employment	Flexibility/ Convenience	Flexibility/ Convenience	Flexibility/ Convenience	Flexibility/ Convenience
Second highest stated factor	Employment/Public transport inadequate/ expensive or unreliable	Public transport inadequate/ expensive or unreliable	Public transport inadequate/ expensive or unreliable	Public transport inadequate/ expensive or unreliable	Public transport inadequate/ expensive or unreliable	Public transport inadequate/ expensive or unreliable	Public transport inadequate/ expensive or unreliable	Public transport inadequate/ expensive or unreliable
Third highest stated factor	Family Commitments/ ***Health***	Employment	Employment	Family Commitments/ ***Cost of Driving***	Employment	***Health***	Employment	Employment

The questionnaire survey used a number of open questions to explore possible future transport strategies. Participants were asked to list future travel strategies which might be the most likely to reduce their car use (see Figure 3). The top three factors identified by participants were: cheaper public transport (32%), improved accessibility to public transport (27%) and increased reliability (11%). Significantly, Figure 3 indicates, a willingness amongst individuals to be prepared to reduce their current car use if adequate transport strategies were introduced and developed that met their needs and requirements. This research concurs well with other findings from this research which suggested that there was a willingness amongst participants to consider reducing their car use (see Figure 2). However the research did not seek to define or understand what participants might have meant by their responses (e.g. cheaper public transport). It was proposed future research would gain an insight into the meaning associated with different transport strategies such as in-depth interviews. These results reinforced that current transport planning strategies are not meeting the needs and aspirations of individuals to reduce their car use and that a new way of developing and conceptualizing future transport strategies to reduce car use is urgently required.

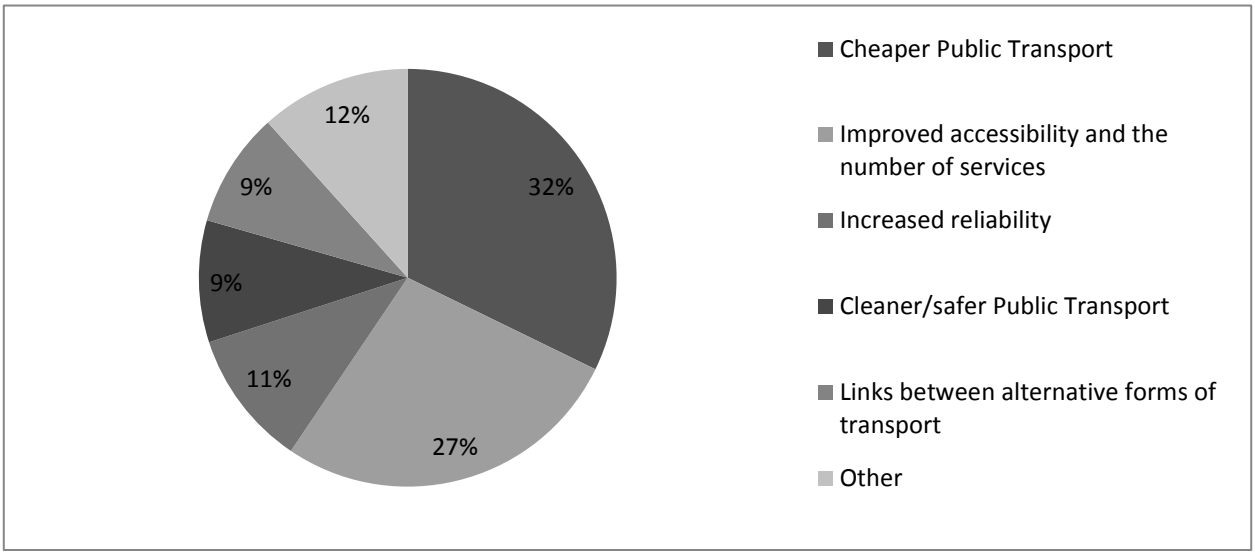

Fig. 3. Proposed future travel strategies to reduce an individual's car use

3.3. Interpreting future travel strategies to reduce car use

Finally, participants were asked about eighteen hypothetical transport strategies (refer to table 3). Participants were asked to indicate how their car use would change if the strategies were developed (i.e. increase, decrease or stay the same). The greatest change in car use was found to be related to the following strategies: 12 (Public transport fares decreased by 25%), 2 (Congestion charge implemented (similar to a London congestion charge) at £5 per day but cycle lanes and public transport facilities were commonly available) and 4 (No change to your commuting distance but access to public transport and cycle lanes were commonly available). To test the statistical relationship between urban demographics and each transport strategy a chi-squared test was performed. The following *p-values* were observed: $p = 0.018$ (age); $p = 0.339$ (levels of deprivation) and; $p = 0.522$ (gender). The data indicated the only urban demographic characteristic to have a statistical relationship when compared to the travel strategies was age. Based upon the results of this data, it is worthwhile to suggest when transport stakeholders such as planners and policymakers develop future transport strategies greater attention should be attributed towards age compared to other demographic characteristics. In addition it should be recognized that the findings from Figure 3 and Table 3 were based upon two separate questions. Figure 3 was based on a question asking participants to state travel incentives they felt would affect their car use the most whereas Table 3 was based on a question asking participants to respond how their car use might change across eighteen different hypothetical travel strategies. The three future travel strategies (12, 2 and 4) were highlighted as they were shown to have the greatest difference to reduce individual's car use compared to the other strategies. For example, The fourth and fifth strategies were shown to have the greatest potential to reduce car use were 11 & 18 which both gained an average score of 2.7 in relation to car reduction.

Table 3. Description of the eighteen future travel strategies

1	No change to urban road structure
2	Congestion charge implemented at £5 per day but cycle lanes and public transport facilities were commonly available
3	Compulsory for all employers to provide shower and changing facilitates
4	No change to your commuting distance but access to public transport and cycle lanes were commonly available
5	All cycle lanes/ parking removed
6	Elevated cycle lanes were commonly available
7	Road tax increased by an additional £5 for the next three years
8	No obligation for employers to provide shower/changing facilities
9	Congestion charging scrapped after 3 years with no improvements to public transport or cycle lanes
10	Fuel increased by 10p per litre for the next 3 years
11	A weeks free trial was available to use public transport or hire a bicycle
12	Public transport fares decreased by 25%
13	Cycle parking was commonly available
14	Automobiles were limited to 20mph for 3 years
15	On road cycle lanes were commonly available
16	Your commuting time increased by 30 minutes but cycle lanes and public transport facilities were widely available
17	Your working hours were flexible
18	Supermarket shopping was discounted by 5% if you used the home delivery service

4. Discussion

The intention of the questionnaire survey was to gain an insight into how urban demographic characteristics influenced car user's attitudes with a view to inform future travel strategies. This research confirms on the whole that individuals are highly dependent upon their car for their daily travel needs. This was despite, two thirds of participants recognizing their car use contributed towards environmental impacts such as climate change. For the purpose of this study an individual was considered to have a strong car dependency if they drove every day or every other day. The findings indicate that environmental concerns such as climate change are less prioritized than other concerns such as health or economic factors. Furthermore Steg [38] discusses how the car is considered in the main as a status of wealth, power or strength. Therefore it was expected individuals would have a strong dependency on the car. The findings revealed that most individuals had a preference towards the car but interestingly were willing to reduce their car use in favor of alternative forms of transportation if the right strategies were put in place (refer to Figure 2).

This suggested that current transport planning strategies are not meeting the aspirations of car users who may want to reduce their car use. This reconfirmed a need for new planning strategies to be developed to support the willingness amongst individuals to reduce their car use in order to promote a greater uptake in alternative forms of transport. Furthermore, one of the strongest findings to be unearthed from this work is that a series of future travel strategies have emerged that might inform transport planners or planning policymakers how to encourage a reduction in car use. In particular, the three future travel strategies shown to promote the greatest overall reduction in car use were:

- Public transport fares decreased by 25% (2.1 average score in relation to car reduction).
- Congestion charge (similar to that of a London congestion charge) was implemented at £5 per day but cycle lanes and public transport facilities were commonly available (2.2 average score in relation to car reduction).
- No change to your commuting distance but access to public transport and cycle lanes were commonly available (2.3 average score in relation to car reduction).

It is worthwhile to recognize that different travel factors had different effects to different groups of individuals in relation to their car use (e.g. Table 2). Throughout the questionnaire survey urban demographics were investigated to determine the influence that they might have towards travel attitudes. The findings illustrate that future transport planning strategies could usefully be tailored towards different age groups. Age was found to have the greatest effect to influence an individual's car use. Therefore this paper argues transport policymakers and planners should avoid attempting a one size fits all approach. Furthermore future planning strategies should be based upon a bottom up i.e. focusing upon stakeholder engagement and local individual's needs rather than a top down approach that typically results in generic strategies which are no tailored towards local individuals. This concurred well with previous research undertaken by Greed [37]. Throughout this paper, it has been argued policymakers, planners and transport authorities should pay greater attention towards developing transport strategies in order to consider the influence of different demographic characteristics and travel attitudes amongst different groups of individuals. This research appeared to indicate age to be a major factor to influence car attitudes when evaluated against hypothetical future transport strategies. This concurred well to Kuhnimhof et al. [36]. However, this is not to suggest that gender or levels of deprivation should be discounted when considering planning for new transport strategies. For example, Polk et al. [39] argue that levels of deprivation or gender are highly influential factors towards car use. It is noteworthy to consider the influence that the design of the questionnaire survey might have had to the research findings. It is logical to assume that car ownership will be higher amongst individuals who are recognized to have a strong affiliation to the car and this might add further reasoning why this research contrasted to previous research studies. Finally, deprived areas of this research study were in general located towards the city center of Birmingham. It is reasonable to assume that those individuals had a greater accessibility to access more amenities within a walkable or cycleable distance of shops or areas of employment and therefore were potentially less dependent upon the car. It is the intention that the findings from this paper will have benefit to transport stakeholders (i.e. planners, policymakers and consultants) as the findings have begun to outline hypothetical future transport strategies that might influence and reduce individual's car use.

5. Conclusion

This study is unique as it sought to investigate the most car dependent individuals within an area of Birmingham. It was therefore the intention of this research to gain an insight into transport strategies that could be developed or implemented in order to enhance and promote the usage of alternative forms of transport with the view to reduce car use. This research was in contrast to previous studies that have often not focused on groups of individuals who are heavily car dependent. Instead, studies have focused upon individuals who have shown a desire to reduce their car use. Therefore features of this study have never previously been investigated and offer a useful insight into how transport stakeholders (i.e. planners and policymakers) might attempt to develop and deliver new future transport strategies that target groups of individuals who are recognized to be highly affiliated towards the car.

Notwithstanding the limitations, this paper has begun to identify the prerequisite for urgent action in planning and transport in order to develop sustainable transport strategies that meet future global, national and local environmental targets, for example, CO_2 emissions. To not act is not a solution. Transport is a global problem and it is important the impacts of excessive car use are not merely dismissed. In order to tackle these impacts a vast effort is needed to decarbonize transport. However it should not be forgotten the complexity associated with developing transport strategies. For example, how individuals want to use and enjoy different spaces is continually evolving and hence this gives rise for the need for ongoing research in order to understand how travel attitudes may change and develop.

Transport planners and policymakers should be encouraged as this research shows that individuals have a willingness to want to reduce their car use and therefore if less reliance on car use is to be encouraged new transport planning strategies must be conceptualized. This was one of the strongest findings from this study. It is vital that new transport strategies take into account the perspective of local demographic factors but also anticipate that not all strategies may have the same effect towards reducing car usage. The results described in this paper have provided a useful insight that achieving sustainable transport should not be portrayed as an unrealistic utopian vision. Furthermore the results from this paper may lend themselves to inform or guide the development of future sustainable transport strategies when developing such strategies across different urban demographic characteristics. It is the intention, that the lessons from this study can be used to inform the development of future sustainable transport planning strategies. However in order to further enhance future

sustainable transport planning knowledge, debate and discussion further research is needed. Consequently this paper has given rise to a number of potential future research avenues; they are as follows:

- To explore why certain future transport strategies/incentives (that seem to encourage a reduction in car use) appear to be more influential or favourable to different urban demographic characteristics.

- To consider how future transport strategies could be developed to increase an individual's ability or willingness to reduce their car use.

- To research additional urban demographic characteristics such as ethnicity or disability in order to compare the lessons learnt from this research and to further enhance the transport planning policy knowledge.

- To investigate the practicalities and barriers that might exist towards implementing hypothetical future transport strategies with both local and national transport stakeholders (i.e. planners, policymakers and consultants).

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